Anomaly Detection from Video Surveillances using Adaptive Convolutional Neural Network

Deepak Mane[1,1], Prashant Kumbharkar[2,] Poonam Pawar[3], Karishma Katkar[4], Siddhali Shah[5], Khushi Jamwal[6]

[1,2,3,4,5,6] JSPM's Rajarshi Shahu College of Engineering, Pune-411033, Maharashtra, India
[1*]dtmane@gmail.com, [2]pbk.rscoe@gmail.com, [3]pam2pawar@gmail.com,
[4]kamma.katkar@gmail.com, [5]siddhalishah185@gmail.com, [5]khushijamwal173@gmail.com.

Abstract. Anomaly detection is finding various anomalous activities taking place in the video. Using an unsupervised learning technique, surveillance videos identify various real-time video anomalies in the dataset. In this paper proposed an adaptive convolutional neural network (ACNN) model of deep learning and classified the anomalies into two classes anomaly and non-anomaly. The two main key points that improve the learning algorithm of ACNN are: first, extract the hidden key features from the frames obtained by converting the videos to images using an adapted Convolutional Neural Network. Second, along with traditional CNN layers proposed model contains customized dropout and dense layers, which improves the performance during training. Performance evaluation is done through the UCF standard dataset. It consists of full-framed real-world videos obtained through CCTVs which are real anomalies like accidents on the roads, fire explosions, and fighting. Here, we predicted various anomalous activities in video anomaly detection by utilizing normal videos and videos containing abnormal activities. The proposed ACNN model produced better accuracy of 91% as compared to other existing algorithms used for the same dataset.

Keywords: Convolutional Neural Network, Pattern classification, deep learning, Anomaly detection.

1 Introduction

Anomaly detection in video frames is essential for surveillance systems due to its abnormal activities that rarely occur in real-time videos. The detection of anomalous illegal activities is an essential aspect of video surveillance. The main aim is to detect abnormal activities such as finding multiple moving entities with significantly less prior knowledge for video surveillance or detecting specific dangerous incidents such as fighting on the roadside captured in the CCTVs, explosions which cause fire, accidents on the roads, etc. The detection process focuses on detecting the video frames that consist of various anomalous activities among videos that the frames indicate. In contrast, segmentation focuses on determining which video frame is

[1] Deepak Mane
*dtmane@gmail.com

showing anomalous activity and which part of the frame is showing anomalous behavior [3]. Existing research and paper studies have focused mainly on finding the anomalies in traffic captured in the surveillance videos. In contrast, we can apply this method to detect many abnormal real-time situations happening in public places. Many researchers used variations of traditional CNN for different applications, which produce state-of-art results [16][17]. The applications of our proposed models are in monitoring the human activities in public places like railway and bus stations, other transportation facility areas like airports, multiplex, big shopping malls, roads, parking areas in public and private places, etc.

The aim of this paper is

- To spot and detect anomalies, including human-caused anomalous activities using the Adapted CNN.
- To recognize anomaly detection from each video this does not restrict n-dimensional data.

An overview of the paper is as follows: section 2 explains the literature survey of various related works in this field. Section 3 contains the proposed architecture, which explains the modules used and describes the ACNN algorithm. Experimental results are depicted in section 4, including model accuracy, model loss, confusion matrix, and classification report. Conclusion and future scope are explained in section 5.

2 Related Work

Anomaly detection comes under the unsupervised learning technique of machine learning which is meant for detecting the abnormal activities or patterns available in the dataset. In 2015, a method was proposed for detecting a real-time anomaly in crowded scenes. Experimental results prove that the algorithm is more time-efficient, and the system can immediately detect anomalies as soon as they occur in videos [1]. Extracting meaningful information from long videos is a challenging task solved in 2016, where two methods are built based on auto encoders first is to learn the features [2]. Automatically detecting abnormal events in long videos is a challenging task solved using generative models proposed in 2016. Also, this model uses convolutional extended short-term memory networks [3]. The most suitable model is chosen based on the prediction accuracy and reconstruction. CNN requires labels as learning signals, but the architecture presented in 2017 uses only two components, one for learning spatial features and the other for representing them [4]. In 2017 a model was proposed to solve the issue that occurs due to inverse problems in imaging by the classical iterative method [5]. Again in 2017, another method of anomaly detection using sparse coding was proposed. TSC is mapped with a stacked recurrent neural network that helps optimize the parameter and increases the speed of anomaly detection [6]. Though FNR works successfully in experimental results, significantly less information about its working mechanism is provided. However, this gap is filled in 2018 by building a connection between the Frobenius-norm-based and nuclear-norm-based representations [7]. A comparative analysis of deep learning-based anomaly detection methods was presented in 2018 [8]. The method proposed in 2017 introduces us to a deep CNN approach that captures the content of the whole image to

study the correlation between the joints; immediate supervision of CNN is used[9]. After that, many modifications and innovations were made in anomaly detection, and noticible results were achieved.

To sum up, all the above papers aim to detect anomalies using various datasets. All the above research is done in various fields. Videos in the dataset are a crucial part of training as the accuracy depends on these factors. Therefore, the model proposed in this paper implements adaptive CNN on the UCF anomaly dataset, intending to detect video anomalies.

3 Proposed Architecture

In this paper, we proposed Adapted Convolutional neural network(ACNN) to train the dataset and to classify it into anomaly and normal events. The Fig 1 represents the system architecture of the ACNN model in a stepwise manner. The two main key points that improve the learning algorithm of ACNN are: first, extract the exact hidden key features from the frames obtained by converting the videos to images using an adapted Convolutional Neural Network. Second, along with traditional CNN layers proposed model contains customized dropout and dense layers, which improves the performance during training. However, proposed model does not restrict any n-dimensional features and handle large amount of data efficiently.

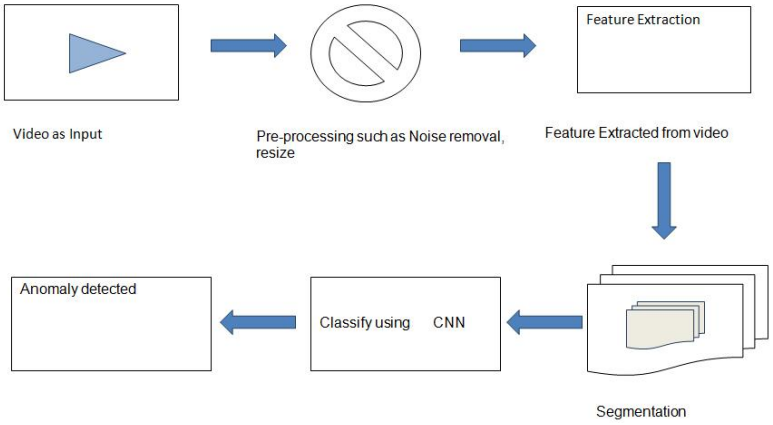

Fig. 1. System Architecture

Video input – video is passed as an input to the system, which is trained using CNN to detect anomalous activities.

Pre-processing- pre-processing involves applying various transformations on the raw data because the raw data, that is, the videos, may contain unnecessary noise disturbances, and some parts of videos maybe not be required, so clearing of these issues is done in pre-processing. The videos are a sequence of images and voice data; the video converted binary data is stored on the hard drive. Mathematically it can be expressed as,

Let D is the dataset. After pre-processing the dataset D' (1)

Feature extraction- the videos are converted to images, and the images are converted to various frames. Feature extraction is the process of extracting or matching the feature present in one object to another object or fining it in that object. After learning the feature from a particular image frame, we try to find it in other image frames. We convert that extracted feature to numerical data and train the data based on these extracted features.

Segmentation- The videos are first segmented into images, and then the images are segmented into frames. These frames can extend up to thousands in numbers depending on the size of the videos. It is a process of breaking the images into sub-images called segments to decrease the complexity caused due to them to make further processing smooth. The 80 percent dataset is used for training, and 20 percent is used for testing. The videos of the training dataset are converted to frames and further passed to the algorithm.

Apply CNN- the training data is then passed to the Convolutional neural network. Proposed ACNN model does not restrict any n-dimensional features and handle large amount of data efficiently which is represented in Fig. 2.

3.1 ACNN learning Algorithm

Select the

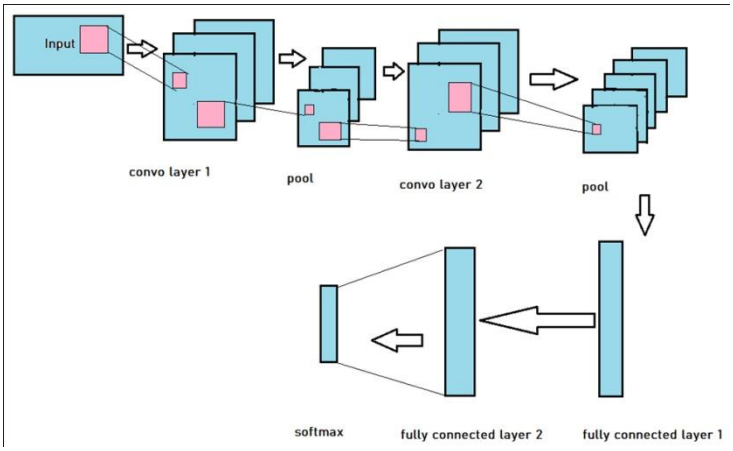

Fig. 2. ACNN architecture

3.1.1 Algorithm for ACNN

Forward steps of ACNN are explained using the following steps

Step I: Select the dataset containing anomalies.

Step II: Pre-processing the dataset, including allocating paths and dividing them into labels, image resizing, etc.

Step III: Splitting the dataset into training and testing data in proportions of 80% and 20%, respectively, to implement ACNN architecture.

Step IV: The output of the pre-processing step is given as an input to the customized convolutional layer, whose task is to extract different features present in the input images $C = I * f$ (2)

n equation (2), I is the input image, and f is the filter.

Step V: The output generated by the convolutional layer is passed to the pooling layer, which is used to decrease the rate of sampling by deducting the dimensions of the rectified feature map.

Step VI: images from earlier steps are passed to a fully connected layer where they are flattened

$$X = Z * V^T \quad (3)$$

Where in equation (3) X=row zero-mean data

Step VII: Dropout and dense are applied to prevent overfitting

4 Experiment Results

4.1 Dataset

The UMN dataset [10] has five differently arranged videos of people running and walking in different directions after some time. The feature that is used to classify the anomalous activity in [10] is the running activity. In [11], the UCSD ped1 contains 70 videos, and ped 2 contains 28 CCTV videos recorded simultaneously. Avenue [12] contains 37 videos again recorded at the same place, but these are short videos with few unrealistic anomalies. BOSS dataset [13] contains the suspicious activities performed by actors, for instance, panic circumstances and misbehaving with a person suffering from the disease. All these mentioned datasets are small in terms of time span and quantity. Moreover, they cover very unrealistic and less variety of anomalies. For our model training, we are using UCF- anomaly dataset, which contains 1000 videos and contains various activities like fighting, explosion, accidents, etc., which are realistic, and these videos are lengthy. Comparison of datasets represented in Table 1.

Table 1. Comparison of Datasets

	Video count	frames	length
BOSS	12	4068	25min
UMN	5	1300	5min
Avenue 37	900		30min
UCSD PED170	205		5min
UCSD PED228	163		5min
UCF-anomaly	1000	6000	5min

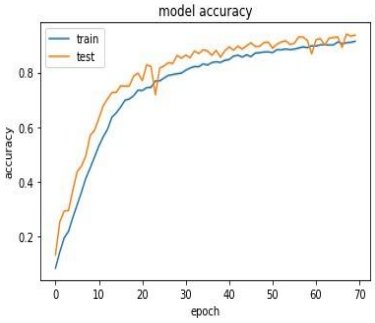

Fig 3. Model Training accuracy

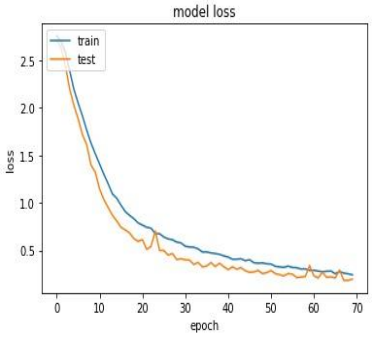

Fig 4. Model Training loss

4.2 Performance Evaluation

The final output layer of ACNN has two neurons which differentiate the entire dataset into two classes anomaly event detected and no event detected. The anomalies detected by our model are fighting, road accidents, and explosion. The videos are kept of original size without shortening them. We have trained our model on 80% of dataset and used 20% for testing our model. Each video generates more than 5000 frames. The model loss and model accuracy of the training and the testing data is as shown in the Fig 3 and Fig 4. To avoid over fitting further the dataset is manually trimmed and cleaned. To enhance the accuracy of the testing the training is increased. The mean squared distribution or mean squared error gives the average of squares of errors and the categorical cross entropy is the SoftMax function.

$$\text{MSE} = \frac{1}{n}\sum_{i}^{n}(y_i - \hat{y}_i^2) \tag{4}$$

$$\text{CCE} = \frac{1}{M}\sum_{p}^{M} -\log\left(\frac{e^{s_p}}{\sum_{j}^{c} e^{s_j}}\right) \tag{5}$$

The entire dataset is trained according to the training curve, and the training accuracy increases logarithmically. A confusion matrix is calculated for the actual and the predicted class, which evaluates our model's performance. The confusion matrix in Fig 5 shows that the accuracy for the anomaly class is 90%, and the non-anomaly class is 92%. The classification report is represented in Table 2. As per Table 3, ACNN has better accuracy than the existing methodology.

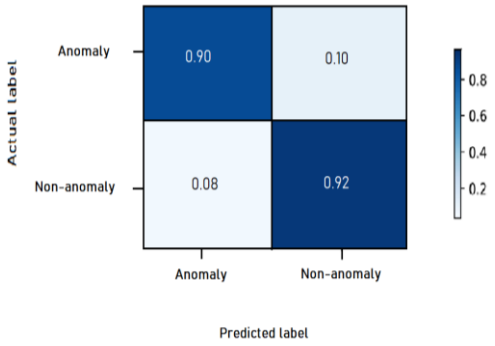

Fig 5. Confusion matrix

Table 2 Classification report.

Class	Precision	Recall	f-score	Support
Anomaly	90.23	91.58	90.54	25,584
Non-anomaly	91.45	90.02	90.96	36,897
Mean	90.84	90.08	90.55	∑= 62,481

Table 3. Result comparison with existing methodology

Reference	**Algorithm**	**Model Accuracy**
2008 [13]	Monitor based algorithm	75%
2015[18]	Un-supervised- RF, t(SNE)	85%
2018[19]	DONN+LSTM	89%
2019 [14]	LSTM convolutional autoencoder	87.30%
2020 [15	Two-stream convolutional networks model	80.47%
2021 [16]	ResNet and ConvLSTM	89%
Proposed model	**CNN algorithm**	**90.80%**

5. Conclusion

Due to the complex nature of these real-world anomalies, using only standard datasets may not be optimum for anomaly detection. This paper uses the ACNN model to detect the anomaly from real-time videos. Initially, we studied and analyzed the traditional techniques in deep learning, which detect real-world anomalous activities in surveillance videos. Here, we proposed an adaptive CNN model detect the suspicious activities observed in the CCTVs will assist in creating and maintaining the security in the public areas. The experimental results on the standard UCF dataset indicate that our proposed model for anomaly detection carries out more outstandingly than existing methods. The experiment results are proved by analyzing the test data results by calculating the confusion matrix and the classification report. Exclusively we have also mentioned the comparative table, which proves our proposed model is more accurate. In the future, we can reduce computational complexity using assembled deep learning techniques and use the best evaluation strategies.

References

1. Sabokrou, M., Fathy, M., Hosseini, M., & Klette, R.: Real-time anomaly detection and localization in crowded scenes. In. IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), pp. 56--62, (2015).
2. Hasan, M., Choi, J., Neumann, J., Roy-Chowdhury, A.K., & Davis, L.S.: Learning Temporal Regularity in Video Sequences. In. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 733--742,(2016).
3. Medel, J.R., & Savakis, A.E.: Anomaly Detection in Video Using Predictive Convolutional Long Short-Term Memory Networks. ArXiv, abs/1612.00390. (2016)
4. Chong, Y.S., Tay, Y.H.: Abnormal Event Detection in Videos Using Spatiotemporal Autoencoder. In: Cong, F., Leung, A., Wei, Q. (eds) Advances in

Neural Networks. Lecture Notes in Computer Science(), vol 10262, pp 189--196 Springer, Cham (2017). https://doi.org/10.1007/978-3-319-59081-3_23
5. Diamond, S., Sitzmann, V., Heide, F., &Wetzstein, G. :Unrolled Optimization with Deep Priors. ArXiv, abs/1705.08041, (2017).
6. Luo, W., Liu, W., & Gao, S.: A Revisit of Sparse Coding Based Anomaly Detection in Stacked RNN Framework. In. IEEE International Conference on Computer Vision (ICCV), pp. 341—349, (2017).
7. Peng, X., Lu, C., Yi, Z., & Tang, H.: Connections Between Nuclear-Norm and Frobenius-Norm-Based Representations. In. IEEE Transactions on Neural Networks and Learning Systems, 29, pp. 218—224, (2018).
8. Khan, Naimat& Wan, Wanggen.: A Review of Human Pose Estimation from Single Image. In. International Conference on Audio, Language and Image Processing (ICALIP),pp.230--236,10.1109/ICALIP.2018.8455796, (2018).
9. Ai, B., Zhou, Y., Yu, Y., & Du, S.: Human Pose Estimation Using Deep Structure Guided Learning. *In.* IEEE Winter Conference on Applications of Computer Vision (WACV*)*,pp. 1224—1231, (2017*).*
10. Unusual crowd activity dataset of university of minnesota. http://mha.cs.umn.edu/
11. Lu, C., Shi, J., & Jia, J.: Abnormal Event Detection at 150 FPS in MATLAB. *In.*IEEE International Conference on Computer Vision, pp.2720-2727, (2013).
12. Wang, J., & Xia, L.:Abnormal behavior detection in videos using deep learning. Cluster Computing, pp. 1—11(2018)
13. Adam, A., Rivlin, E., Shimshoni, I., & Reinitz, D.: Robust Real-Time Unusual Event Detection using Multiple Fixed-Location Monitors. In. IEEE Transactions on Pattern Analysis and Machine Intelligence, 30,pp.555—560, *(2008).*
14. Lu, Y., Mahesh Kumar, K., Nabavi, S.S., & Wang, Y.: Future Frame Prediction Using Convolutional VRNN for Anomaly Detection. In. 16th IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS), pp. 1—8, (2019).
15. Hao, W., Zhang, R., Li, S., Li, J., Li, F., Zhao, S., & Zhang, W.: Anomaly Event Detection in Security Surveillance Using Two-Stream Based Model. In. Secur. Commun. Networks, pp. 8876056:1--8876056:15, (2020*).*
16. Vosta, S., & Yow, K.C.: A CNN-RNN Combined Structure for Real-World Violence Detection in Surveillance Cameras. In. Applied Sciences, (2021).
17. Mane, D.T., & Kulkarni, U.V.: Visualizing and Understanding Customized Convolutional Neural Network for Recognition of Handwritten Marathi Numerals. In. Procedia Computer Science, 132, pp. 1123--1137, (2018).
18. Lundström, J., Morais, W.O., & Cooney, M.D.: A holistic smart home demonstrator for anomaly detection and response. In. IEEE International Conference on Pervasive Computing and Communication Workshops (PerCom Workshops), pp. 330—335, (2015).
19. Naseer, S., Saleem, Y., Khalid, S., Bashir, M.K., Han, J., Iqbal, M.M., & Han, K.: Enhanced Network Anomaly Detection Based on Deep Neural Networks. In. IEEE Access, 6, pp. 48231-48246, (2018).

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DEEP LEARNING AND AI BASED APPROACH FOR COVID-19

Mr. Rahul Rajput, Mr. Sohan Ovhal, Mr. Sanket Takale
Student in Computer Engineering.
JSPMS Rajarshi Shahu Clg Ofengineering Pune

Prof. Amruta Hingmire
JSPM'S Rajarshri Shahu College of Engineering Pune

Mr. Rupesh Mahajan
Student in Computer Engineering.
JSPMS Rajarshi Shahu Clg Of Engineering Pune

Abstract: **The prominence of COVID-19 has already been attributed to a current Forward Transcribed – Polymerase Chain Reaction (RT-PCR) framework. behind because of confined accessibility of check units and generally low sure symptoms within the starting phases of the infection, encouraging the requirement for optionally available preparations. To develop COVID-19 ailment prediction tool based totally on Artificial Intelligence may be helped. In the proposed machine CT pictures of X-rays are skilled the use of Convolutional Neural Network strategies, which could assist device to mechanically expect the COVID-19 detection. The accuracy has established to be better than other strategies. Our proposed machine can obtain nearby 93-94% of accuracy for detection of Covid-19 on bases of x-ray.**

Keywords:- **COVID-19, CNN Architecture, Deep-Learning**

I. INTRODUCTION

Coronavirus is a SARS (Severe Acute Respiratory Syndrome), initially located in the Wuhan district of China in December 2019. Since its starting place it has quick unfold across all countries tainting proper round 44 million people worldwide and inflicting casualty of extra than 1 million individuals. It is an incredibly infectious illness the manifestations of which might be portrayed by way of fever, windedness, hack and lack of scent. The hatching time of Covid-19 territories from 1 to 12.Five days with the middle being five-6 days but can soak up to fourteen days. As a result of a long hatching period, the contaminations unfold out dramatically on the grounds that people are blind to the manner that they have got gotten the illness and unwittingly unfold it. The identity of COVID-19 sickness is essentially vital and essential with the aim that the ones infected can get activate remedy and care, simply as be disengaged to reduce the unfold of the infection. As indicated by way of WHO, it's miles compulsory that the sufferers be SARS-CoV2 RNA from breathing data got screened by Reverse Transcriptase Pcr Method (RT-PCR), which can also understand SARS-CoV2 RNA. While RT-PCR has been the high-quality best stage take a look at on account that it's far highly specific, it is tedious and the affectability is inconsistent, numerous reports proposing helpless affectability. Thus a need fulness for a quick screening method arises that may help professionals to quickly emergency to be moreover allotted to be tried via RT-PCR. Chest radiographs are the most usually applied imaging technique in radiology. They are less expensive and more effectively accessible than Computed Tomography and Magnetic Resonance Imaging. Coronavirus uncovers a few radiological mark that can be effortlessly recognized via chest radiographs. Aside from this, there are distinct blessings that would be applied with admire to chest radiographs. Chest radiographs empower brief triaging of sufferers which should be viable in corresponding with viral testing to moderate the high number of tainted individuals in zones maximum inspired where the restriction is overburdened by using request. Alongside this chest radiographs can be taken in a secluded room sooner or later lowering the danger of compression of the infection. The programmed investigation and identification can be utilized with profound studying primarily based methodologies. Convolutional Neural Networks essentially have been effective because of their capability to gain includes obviously from area express pix distinct to old style AI calculations. Perhaps the most prevalently embraced strategies within the discipline of clinical imaging is circulate getting to know and to utilize facts got from making ready fashions beginning with one place applied over then onto the following. This technique is specifically a success whilst the explained dataset is more modest.

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Alongside regular starting disorder like fever and exhaustion, numerous cases were found tainted with pneumonia and the anomalies have been appeared in their chest CT exam. Serious respiration torments, constant heart harm and other auxiliary contaminations were seen in CT pics. Restricted accessibility of RT-PCR test packs, time had to handle the take a look at, low positive quotes in beginning stages and necessity of amazing human skill requests an innovative approach for discovery of COVID-19. In such an - top notch situation, the non-obligatory preparations investigated ought to discover much less costly methodologies for perceiving, controlling and treating this normal pandemic. Besides, the encouraged method need to assist professionals with altogether knowledge the critical motives and development of the illness. Designing processes, as an For example, image processing and innovative AI calculations can generate identifiable proof of milestone additions and injuries, enabling classification of the data objects as a standard or contamination-related occurrence. Computed Tomography (CT) images of the chest are amongst the techniques used to detect pneumonia. We suggested detecting the input picture as common or COVID-19 encouraged instances using chest Images plus CNN, U-Net.

II. LITERATURE SURVEY

Domenico Gaglione and Paolo Braca[1], Naive Bayes was been used for tracking an object and for prediction where they proposed strategy can gauge disease and recuperation When dealing with real data from the Lombardia region of Italy and the Us, it was able to detect and predict the epidemiological curve with great precision. Ai - based techniques applied in the recognition and classification of coronavirus disease 2019 (COVID-19) medical images, O.S.Albahri, A.S.Albahri, and N.A. Rashid [2]. Their framework demonstrated that the way toward evaluating and benchmarking of AI grouping procedures which could be utilized in the identification and determination of COVID-19 clinical images.

Shuo Wang and Yao Lu[3] , Used the quantitative analysis of imaging data using artificial intelligence (AI) and CT, positron emanation tomography - CT (PET/CT), lung ultrasound, and attractive reverberation imaging (MRI) were been utilized for identification, treatment, and follow-up, which expressed that ordinary imaging attributes and their progressions can assume a significant part in the detection and the management of COVID-19.Michael. J. Horry and Subrata Chakraborty [4], Data analysis was performed on input sensor values and Reviewed writing accessible on Covid-19, checking methods, and proposed an IoT based design, which can be utilized to limit the spreading of Covid-19.

O.S.Albahri, A.S.Albahri, and N.A.Rashid [5] are 3 among the most important Islamic scholars. The system was divided into 5 parts: Disease Data Collection and Uploading (using wearable sensors), Quarantine/Isolation Centers, Data Management Center (using AI calculation), Health Physicians, and SVM Cloud Infrastructure. Application programs were tested by Nadeem Ahmed and Wanli Xue [6] in order to create a next-generation app design that would allow for better tracking and safety performance. An outline was created for android applications developed for universal contact tracing. Ravi Pratap Singh and Mohd. Javaid [7], They explore, speak,and spotlight the overall applications of the wellproven IoT sources of info were takenfrom web jour nalsand applicable reports and information setfrom data bas es of Google student, Pub Med, and SCOPUS utilizing the watchwords

III. IMPLEMENTATION DETAILS OF MODULE

AI and machine learning can be used to detect covid in this sytem. The x-ray scan images are considered under deep learning. There we categorized the results in two separate form i.e. covid +ve or covid –ve, which we will collect and apply algorithm (CNN: - Convolutional Neural Networks)

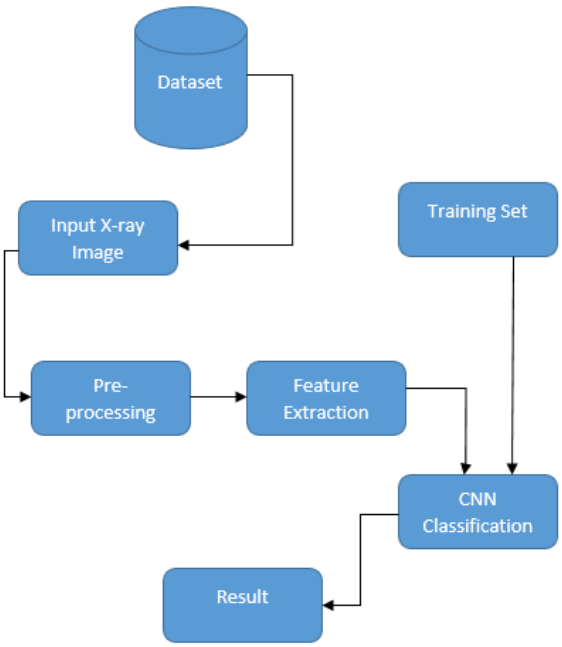

Fig: - System Architecture

Prepare a trained report to evaluate with similarly peoples information. Convolutional Neural Networks is a popular deep studying method for current visible popularity duties. There are 4 layered concepts in Convolutional Neural Networks:

1. Convolution,
2. ReLu,
3. Pooling and
4. Full Connectedness (Fully Connected Layer).

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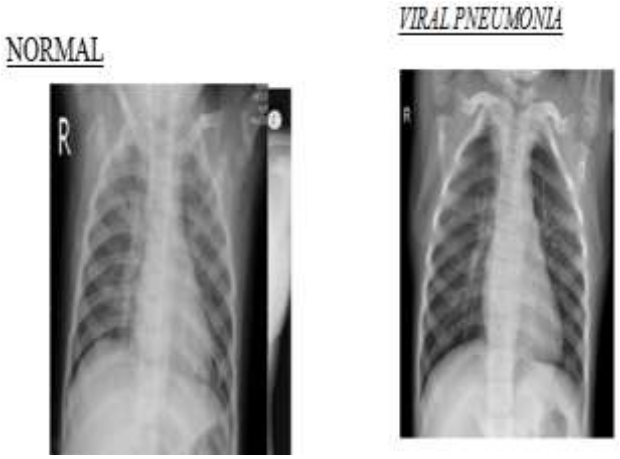
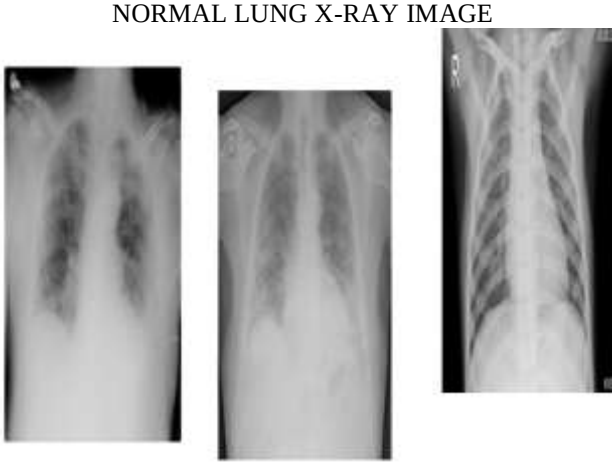
The enter statistics capabilities will be compared with the already educated picture on the premise of closed fit the result might be expected. Once the enter image is processed the system further predicts whether or not the patient is inflamed with COVID-19 or Not. We have designed a device the use of python as backend and HTML/CSS as the front quit, we have a website where we can upload an photograph and put up and system then procedure that photograph and output is predicted

SAMPLE IMAGES FROM DATASET



NORMAL LUNG X-RAY IMAGE



VIRAL PNEUMONIA X-RAY IMAGES

IV. EXPERIMENTAL RESULTS AND DISCUSSION

Different operation measurements like Efficiency, F1-Score, Sensitivity, Clarity, Perfection, and Recall would be used to carry out test assessment of the algorithms. These evaluation measurements are specially precious even as assessing a medical screening framework, which is the cause picked for the errand of COVID19 forecast too. The following are some performance metrics given.

$$\text{Precision} = \frac{\text{TP}}{(\text{TP} + \text{FP})},$$

$$\text{Recall} = \frac{\text{TN}}{(\text{TN} + \text{FN})},$$

$$\text{F1} - \text{Score} = \frac{2 * (\text{Precision} * \text{Recall})}{(\text{Precision} + \text{Recall})}.$$

$$\text{Accuracy} = \frac{(\text{TP} + \text{FN})}{(\text{TP} + \text{TN} + \text{FP} + \text{FN})},$$

$$\text{Sensitivity} = \frac{\text{TP}}{(\text{TP} + \text{FN})},$$

Every one of the fashions is performed using Python3 Keras library, with Tensor Flow as backend. Every models are assessed, in which in each break up eighty% of the statistics is saved for training motive (educate information) and the rest for (testing facts). The Convolution and Pooling portions of each one of the version is probably trailed via completely associated layers, with ReLU actuation lastly a solitary hub forecast layer with sigmoid initiation paintings. Following is the table predicated for our frameworks getting ready and expectation time.

Model	Training Time(sec)	Prediction for one sample(sec)
InceptionV3	3505.996002	0.026050332
Resnet50	3499.539274	0.020517541
Dense Net	4480.50542	0.027824167

V. CONCLUSION

We created an AI-based technology for automatic identification of the COVID-19 infection in order to meet the immediate necessity that has arisen in the battle against by the COVID-19 pandemic. The efficiency of the proposed method is described by the excellent performance parameters achieved in terms of precision, specificity, and accuracy for input samples from one-of-a-kind sources. In the lack of chest CT images, the suggested CNN framework ensures to be a better alternative capable of doing the job with little information. CNN's capacity to cope with a large variety of image sizes makes it scale invariant. The proposed fully convolutional network exceeds existing CNNs in terms of preparation sample, scaling, specific pixel location, durability, and basic accuracy, as per a review.

VI. REFERENCES

[1]. Domenico Gaglioneand Paolo Braca , “Adaptive Bayesian Learning and Forecasting of Epidemic Evolution Data Analysis of the COVID-19 Outbreak

", IEEE Access ,2020

[2]. O.S.Albahri , A.S.Albahri and N.A.Rashid , "Systematic Review of AI Techniques in the Detection & Classification of COVID-19 ", Elsevier , 2020

[3]. ShuoWang and YaoLu , "The role of imaging in the detection and management of COVID-19: a review ",IEEE 2020

[4]. Michael. J. Horry and Subrata Chakraborty, "Role of IoT to avoid spreading of COVID-19", International Journal of Intelligent Networks,2020

[5]. Nadeem Ahmed and WanliXue , "A Survey of COVID-19 Contact Tracing Apps ",IEEE Access,2020

[6]. Ravi Pratap Singh and Mohd Javaid, "Internet of things (IoT) applications to fight against COVID-19 Pandemic ",2020

[7]. O.S.Albahri , A.S.Albahri and N.A.Rashid , "Systematic Review of AI Techniques in the Detection & Classification of COVID-19 ", Elsevier , 2020

[8]. Shuo Wang and Yao Lu , "The role of imaging in the detection and management of COVID-19: a review ",IEEE 2020

[9]. Alzubaidi MA and BanihaniR,"An IoT-based Framework for Early Identification and Monitoring of COVID-19 Cases ", Journal Pre-proof, 2020

[10]. Nadeem Ahmed and WanliXue , "A Survey of COVID-19 Contact Tracing Apps ",IEEE Access,2020

[11]. Ravi Pratap Singh and Mohd Javaid, "Internet of things (IoT) applications to fight against COVID-19 Pandemic ",2020

[12]. Krishna Kumar and Rachna Shah, "Role of IoT to avoid spreading of COVID-19", International Journal of Intelligent Networks, 2020

[13]. Joseph Paul Cohen and Lan Dao, "COVID-19 Image Data Collection: Prospective Predictions Are the Future",Cornell University

[14]. Ahmed Farid and hatemAwad, "A Novel Approach of CT Images Feature Analysis and Prediction to Screen for Corona Virus Disease (COVID-19)"

[15]. Ashwin Rachha , " COVID-19 Chest X-RAY Detection : A Transfer Learning Approach ", nternational Research Journal of Engineering and Technology (IRJET), 2020

[16]. Jyoshna Rani Koti and ArunaKokkula , " Study on AI Utility for Covid-19 Identification using CT Images", International Research Journal of Engineering and Technology (IRJET) , 2021

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CROP RECOMMENDATION SYSTEM

Mr.Tusharpangare, Mr. Sujithingane, Mr.Rohandhore, Mr. Gauravbhore
Student in Computer Engineering.
JSPM'S Rajarshi Shahu College of Engineering Pune

Prof. Amruta Hingmire
JSPM'S Rajarshi Shahu College of Engineering Pune

Abstract: **Encouraged to enter In general, agriculture is the backbone of India and also plays an important role in the Indian economy by providing a certain percentage of domestic products to ensure food security. But now-a-days, food production and prediction is getting depleted due to unnatural climatic changes, which will adversely affect the economy of farmers by getting a poor yield and also help the farmers to remain less familiar in forecasting the future crops. This research work helps the beginner farmer in such a way to guide them for sowing reasonable crops by deploying machine learning, one of the advanced technologies in crop prediction. Random Forest, a machine learning algorithm puts forth in the way to achieve it. The seed data of the crops are collected here, with the appropriate parameters like temperature, humidity and moisture content, which helps the crops to achieve a successful growth. In addition to the so Gware, a mobile application for Android is being developed. The users are parameters like temperature and theirs oil condition will be taken automatically in this application in order to start the prediction process.**

Keywords:- **Machine Learning, RandomForest Algorithm, Django**

I. INTRODUCTION

Weather plays an important role in agriculture production. For optimal productivity at a given condition crops must be such that their weather requirement matches the Current weather system. So we need to plan them according to the weather conditions and soil fertility. This is a prototype for a crop recommendation algorithm in Python using Machine Learning and Data Analytics. This work presents a system, in the form of a website. The business logic in Python uses Machine Learning techniques in order to predict the most profitable crop in the forecasted weather and soil conditions. The proposed system will integrate the data obtained from soil and by applying machine learning algorithm. This provides a farmer with a variety of options of crops that can be cultivated.

II. PROBLEM STATEMENT

Crop prediction is one of the challenging problems in precision agriculture, and many models have been proposed and validated so far. This problem requires the use of several datasets since crop yield depends on many different factors such as climate, weather, and soil, use of fertilizer etc. To develop Soil detection and Crop prediction system.

III. LITERATURE SURVEY

1. Paper Name: Crop Yield Analysis Using Machine Learning Algorithms
Author: Fatin Farhan Haque, Ahmed Abdelgawad, Venkata Prasanth Yanambaka, Kumar Yelamarthi
Abstract::-Agriculture is not only a huge aspect of the growing economy, but it's essential for us to survive. Predicting crop yield is not an easy task, asit depends on many parameters such as water, ultra-violet (UV), pesticides, fertilizer, and the area of the land covered for that region. In this paper, two different Machine Learning (ML) algorithms are proposed to analyze the crops' yield. These two algorithms, Support Vector Regression (SVR) and Linear Regression (LR), are quite suitable for validating the variable parameters in the predicting the continuous variable estimation with 140 data points that were acquired. The parameters mentioned above are key factors affecting the yield of crops. The error rate was measured with the help of Mean Square Error (MSE) and Co efficient of Determination (R2), where MSE gave out approximately 0.005 and R2 gave around 0.85. The same dataset has been used for quick comparison between the algorithms' performances.

2. Paper Name::-An Analytical Approach for Soil and Land Classification System using Image Processing
Author: Prof. A. V. Deorankar
Abstract:—In the last few decades researchers are interested in land mapping and its classification due to various reasons. The reasons for an increase in the focus of the research community are, the increasing demand for agricultural land and soil health analysis, as the health of the soil, is essential for the healthy production of crops. Image classification is one such approach for soil and land health analysis. It is a complex process having the effects of various factors. This

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paper has proposed the study of current researches, the problems it addressed, and its prospects. The emphasis is focused on the analytical study of various advanced and efficient classification mechanisms and techniques. Here, it has been attempted to study the factors these approaches have addressed to improve the accuracy of the classification. Proper utilization of the number of features of remotely sensed data and selecting the best suitable classifier are most important for improving the accuracy of the classification. The knowledge based classification or Non-parametric classifiers like decision tree classifier or neural network have gained more popularity for multisource data classification in recent times. However, there is still the scope of further research, to reduce uncertainties in the improvement of accuracy of the Image classification mechanisms.

IV. MATERIALS ANDMETHODS

A.Dataset:- we are using the Crop Recommendation Dataset from Kaggel. It contains 2.5k total summaries.

Table1

NITROGEN	PHOSPHORUS	POTASSIUM	TEMPERATURE	HUMIDITY	PH	RAINFALL	CROP
90	42	43	21	82	6.5	203	rice
71	54	16	23	64	5.7	88	maize
40	72	77	17	17	7.5	89	chickpea
13	60	25	17	21	5.7	128	kidneybeans
2	24	38	25	92	5.9	112	pomegranate
91	94	46	29	76	6.1	93	banana

As shown in Table 1, Dataset contains 7 entities:

Data fields

- N - the ratio of Nitrogen content in the soil
- P - the ratio of Phosphorus content in the soil
- K - the ratio of Potassium content in the soil
- temperature - temperature in degree Celsius
- humidity - relative humidity in%
- ph-ph value of the soil
- rainfall - rainfall in mm

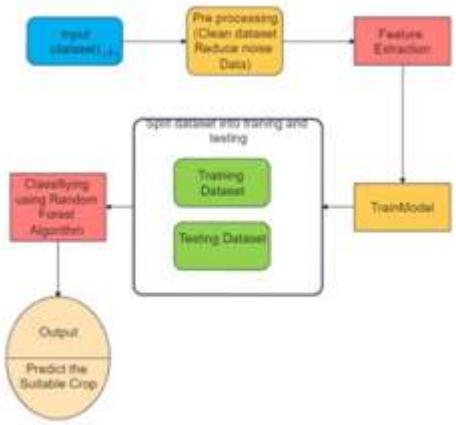
V. IMPLEMENTATION DETAILS OF MODULES.

A.MODULESANDSYSTEMARCHITECTURE:-

Module 1: Preprocessing of Data
-Clean dataset
-Reduce noise Data
Input: Training & Testing Data
Output: Required Data for the Prediction

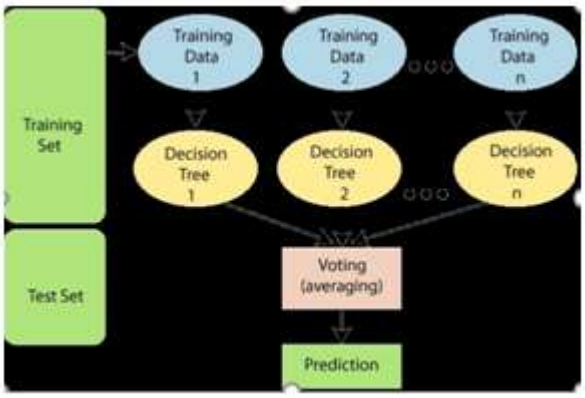
Module 2: Classification based on different factors.
-Feature Extraction(Similar features are extracted from the dataset for Training Model)
-Training Model and splitting it into Training Dataset and Testing Dataset.

Module 3: Suggestion of Crop
-Classifying model using Random Forest Algorithm and Predicting the suitable crop.



System Architecture

B.ALGORITHM:-
Random Forest Algorithm-
Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML
Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset.
Instead of relying on one decision tree, the random forest takes the prediction from each tree, and based on the majority votes of predictions, it predicts the final output.



Working of RFA (Random Forest Algorithm)

C. features

1. Input values:- fig(1) shows the webpage for taking entities values from users. Total seven values of entities

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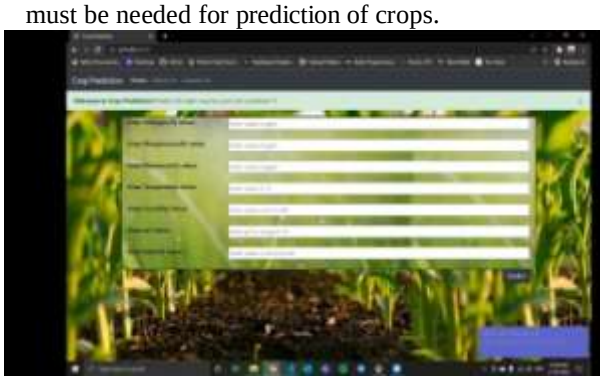
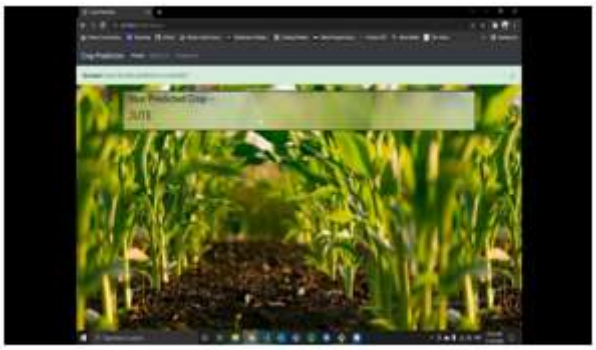
must be needed for prediction of crops.



fig(1)

2. Prediction:- fig(2) shows the predicted crop according to given input data.



fig(2)

VI. CONCLUSION

Amodel is proposed for predicting oil series and providing suitable crop yield suggestions for that specific soil and weather. The model has been tested by applying different kinds of algorithms. RANDOM FOREST shows highest accuracy in soil classification and suggests crops with less time. It gives us more accuracy as compared to existing systems and gives more benefit to farmers.

In reference to rain fall c and e pict whether extra water availability is needed ornot. This research work can be enhanced to a higher level by availing it to the whole India.

VII. REFERENCES

[1] Arun Kumar, Naveen Kumar, Vishal Vats, "Efficient Crop Yield PredictionUsing Machine Learning Algorithms", International Research Journal of Engineering and Technology(IRJET)- e-ISSN: 2395-0056,pISSN:2395-0072, Volume: 05 Issue: 06—June-2018

[2] Nithin Singh saurabhchaturvedi, "Weather Forecasting Using Machine Learning",2019 International Conference on Signal Processing and Communication (ICSC) Volume: 05 —DEC-2019.

[3] Aakash Parmar Mithila Sompura, "RainfallPrediction using MachineLearning", 2017 International Conference on (ICIIECS) at Coimbatore Volume: 3 — March 2017.

[4] Sachee Nene Priya, R "Prediction of Crop yield using Machine Learning", Amodel is proposed for predictings oil series and providing suitable cropyield suggestions for that specific soil and weather. The model has been tested by applying different kinds of algorithms. RANDOM FOREST shows highest accuracy in soil classification and suggests crops with less time.It gives us more accuracy as International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 02 — Feb-2018.

[5] Ramesh Medar Anand M. Ambekar, "Sugarcane Crop prediction Using Supervised Machine Learning" published in International JournalofIntelligent Systems and Applications Volume: 3 — August 2019.

[6] Andrew Crane Droesch, "Machinelearning methods for crop yield prediction and climate change impact assessment in agriculture", Published by IOP Publishing LtdVolume:05—OCT-2018.

[7] Vinita Shah Prachi Shah, "Groundnut Prediction Using Machine Learning Techniques",publishedin IJSRCSEIT.UGC JournalNo:64718—March-2020.

[8] Renuka Sujata Terdal, "Evaluation of Machine Learning Algorithms for Crop Prediction" Published in International Journal of Engineering and Advanced Technology (IJEAT) Volume-8 — August 2019.

[9] P. Vinciya, Dr. A. Valarmathi, "Agriculture Analysisfor Next GenerationHigh Tech Farming in Data Mining" IJARCSSE,vol. 6, Issue 5, 2016

[10] Shivnath Ghosh,Santanu Koley, "Machine Learning for Soil Fertility and Plant Nutrient Management using Back Propagation Neural Networks" IJRITCC, vol. 2, Issue2,292-297,2014.

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Implementation paper for Weed Detection in Agricultural Crops

Pradnya Nikam, Kartiki Borage, Shreyash Lokhare, Shraddha More, Prof. Pushpavati V. Kanaje
Dept. Of Computer Engineering,
JSPM's Rajarshi Shahu College of Engineering, Maharashtra, India

Abstract -When a plant is in a place where it shouldn't be, it is called as weed. Weeds are one of the major problems faced by the farmers because they result in reduction of yield. There are few algorithms developed to identify crops and weeds. In this paper, we focus on identifying the weed present between the crops which compete with the crops for nutrition, sunlight, water etc. The objective to develop such a model is that, if we identify weeds, we can find out which areas should not be sprayed with pesticides, water and other nutrition and eventually it will result in reduction of weed. In our paper, we have proposed a system in which we will pass a video and CNN, Yolo algorithms are used to identify the weed. The purpose of selecting Yolo algorithm is that it has become a industry standard for object detection due to its speed and accuracy and CNN helps us to reduce images in such a form that processing becomes easier, also this process does not result in losing any features that are critical for giving us good prediction. The contributions of this paper are to: study and present an approach to identify weeds that are present in crops, develop a method that can identify weed in plantations.

Keywords- Weed detection, Crops, Convolutional Neural Network (CNN), Image Processing, and Machine Learning.

I. INTRODUCTION

The agricultural industry plays a very important role in the economy of India. India ranks second largest in terms of population and also among the top agricultural produce exporters. But still in most of the areas, farming is done in traditional ways. One of the major problem faced that result in considerable decrease in yield is weeds. Weeds are basically those plants that grow at undesired areas.

Detecting weeds in agricultural crops is a problem that is faced because it is difficult to manually look out for weeds in such a large space where crops are present as well. There is always increasing demand for vegetables and crops but the yield gets reduced due to the weeds present. These weeds are harmful for the crops as they try to consume the nutritious elements, sunlight, water and pesticides that a meant to be used by the crops. The objective behind detecting weed is basically to improve the yield by bringing in the technology that can be used in agricultural areas to do patch spraying.

The proposed system identifies weed based on the dataset that is trained, where it is present, and draws a bounding box around it also describing the precision. This can be used with the sprayers for minimal spraying in such areas and maximum spraying on the crops. For Image Processing and machine learning based classification of weeds and crops, there are several proposed methodologies.

II.RELATED WORK

Image Processing and Machine Learning according to the stages of weeds and plants, a number of methods are proposed.

XIAOJUN JIN [1] suggested that the accuracy obtained by a trained CenterNet model during the field test was 95.6%. Here vegetables were found and cartons were drawn next to them and the items that were not tied to the boxes were considered weeds. Basically the first step taken here was the acquisition of the image. Here pictures of white Chinese cabbage were found for experimental purposes. Then a photo-enhancing technique was used to collect color, brightness, rotation and 1150 images were expanded to 11500. The hand annotation was used to draw the used vegetable binding boxes in Training CenterNet model. Then the model was trained and tested to get the desired result. According to the results of the study it was proposed that this method be able to identify weeds in vegetable cultivation.

The same weed processing method for weed detection can achieve 91.1% accuracy as proposed by Mother Shesher S [4]. The PWDS method is implemented using Convolutional Neural Networks. The exact values of crop diversity and weed detection are compared with the values suggested by S. Haug, J. Ostermann, and R. Bosch's paper A Crop / Weed Field Image Data set for Evaluation of Computer Vision Based Precision Agriculture Tasks and PWDS Model has more accuracy. The use of the neural

network makes it more efficient because only pixels of the input image are used by the system as neurons.The use of hyper spectral data collection followed by label production and classification is a method proposed by Xiuping Jia [6] where the hyper spectral imaging system was used to collect study materials including Hyme, Alli, Azol, and Hyac. Then with the use of data augmentation the number of images increased by 2000 at each weed stage.The CNN model had 2FC layers. Structural configurations include a flexible layer, an indirect layer and a large integration layer. The recognition size of the 500 x 500pixel size is 21.83%, 250 x 250 by 24.43% and 125 × 125 by 21.57%.

III.PROPOSED SYSTEM

The proposed model detects the weeds from all the crops. In this model some machine learning algorithms along with image processing techniques will be used to detect the weeds in the crops. In the initial stage acquiring the images of the field is done. Getting the images of the field can be done manually or attaching a camera behind the tractor.

Module wise explanation-

Conversion of video(input) to frames-

The proposed system does not understand the video as input, so the very first step is to convert the video into number of frames(images). We need a folder in the same project location to store the converted frames from the video. If the folder doesn't exist then it creates its own folder and stores the frames. The frame creation will start from value 0 until the last frame.

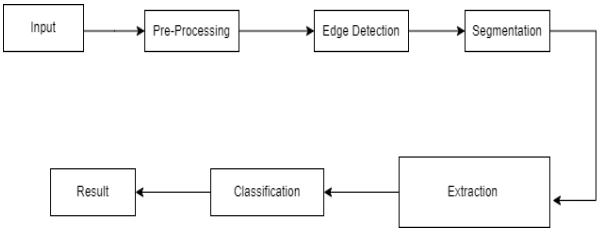

Fig.[1]: Proposed System

2. Conversion of the image into Greyscale image

-Once we have the images from the crops, our next step is to load the captured image of acquisition unit and do pre-processing on it. The RGB image is converted to Grayscale image. Using Grayscale instead of RGB can save your time. However, this might not be true for every case. Some images may be enhanced getting processed with colors. But for the proposed system we need to convert the images into grayscale images. Then our next aim is to find the threshold image. Thresholding produces a binary image, where we can see that all the pixels with intensities above (or below) a threshold value is turned on, while all other pixels are turned off. The binary images produced by thresholding are held in 2-Dimensional NumPy arrays, since they have only one-color value channel. They are Boolean so they contain the values 0 and 1

3. Classification-

Neural networks are designed as per our brains. When you give image as input data to the model, it takes the pixel values and gives the unique visual effects. When the images are given, CNN algorithm will detect the edges of the picture. After this the definition of the image will get passed to the next layer. In the next layer, corner and color groups will be detected and the definition of the image will get passed to the next layer and this cycle continues until a precision is made. The main role of CNN in our proposed model is to reduce the images into a form that is easier to process, for a good prediction.After this, non-linearity of the images is increased by RELU (rectified linear activation unit). The images are non-linear, so for that purpose RELU is done. After RELU, the pooling layer is done, which is another building block of CNN. The spatial size of our representation is reduced, so because of this the network complexity and computational cost is lowered. In the last step, flattening is done. Flattening creates a single long feature vector. This feature is used for the final classification.

4. Architecture Diagram

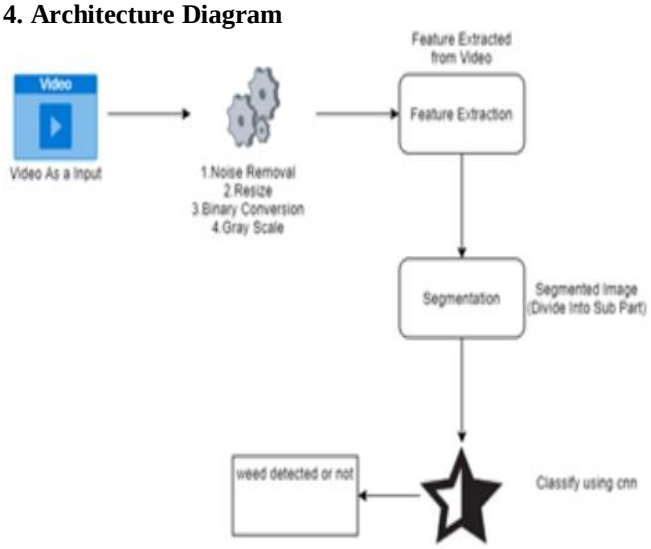

Fig.[2]: Architecture Diagram

5. Intersection over union (IOU)

Intersection over union (IOU) is a phenomenon in our model i.e., weed detection that describes how boxes overlap. This algorithm uses IOU to provide an output box that surrounds the unwanted crops perfectly.Each grid cell is responsible for predicting the bounding boxes. The IOU sets to 1 if the predicted bounding box is as close as the real box.

6.Working of YOLO in our model

In the very first step, the image is divided into grid cells. Each grid cell forecasts N bounding boxes and provides

their scores. The cells predict the overall class probabilities to obtain the class of each weed.
Intersection over union ensures that the predicted bounding boxes are equal to the real boxes of the weeds. This phenomenon eliminates unnecessary bounding boxes that do not meet the characteristics of the weeds (like height, width and class). The final detection will consist of unique bounding boxes that fit the weeds i.e., all the unwanted crops perfectly.

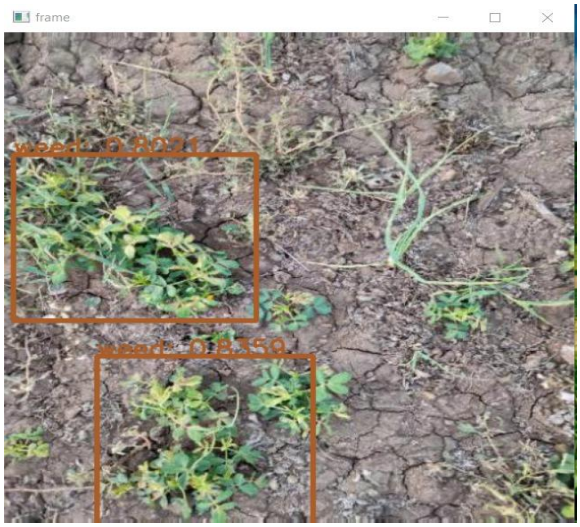

Fig.[3.1]: Output(Weed Identification)

Fig.[3.2]: Output(Weed Identification)

IV.EXPERIMENTAL RESULT

The experiment is performed with a well performing dataset for validation confirmation and for working on any impartial bias in dataset. The tests were performed in a series of separation of test training data. If the model is set training, 30% of the database is set for verification of training steps, therefore the database was divided into various trainings and groups of testing a data sets. Training and the test was divided into a 10:80 scale where 10% is of testing database and 80% training and remaining more 10% of the database is reserved for more cross-checking and for validation of the weeds to be identify. After train, test are performed some more anonymous photographs taken to show you weed in them which were not in the database for training. This learning model approach process has been able to predict weed accurately at 90 to 95%. Incorrect detection appear to be very close what a computer thinks it is. The detection function of this learning model was as good as it perfectly detect the weed , even with different backgrounds in such hand, soil and various natural conditions such as morning, afternoon and evening time. Here Picture shows a summary of the various results obtained weed detection in the affected test dataset.

1. Graph Result(Accuracy/Loss):-

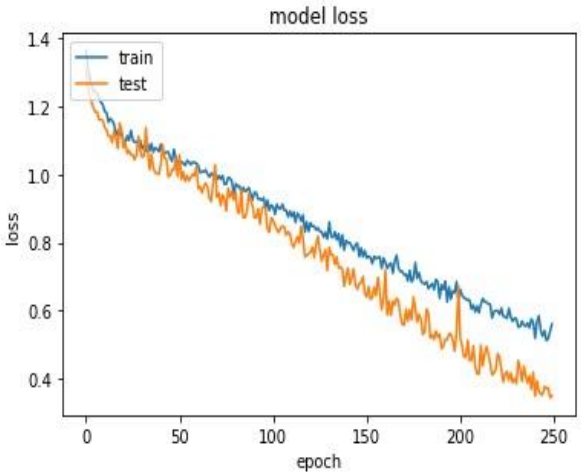

Fig.[4.1] : Model loss

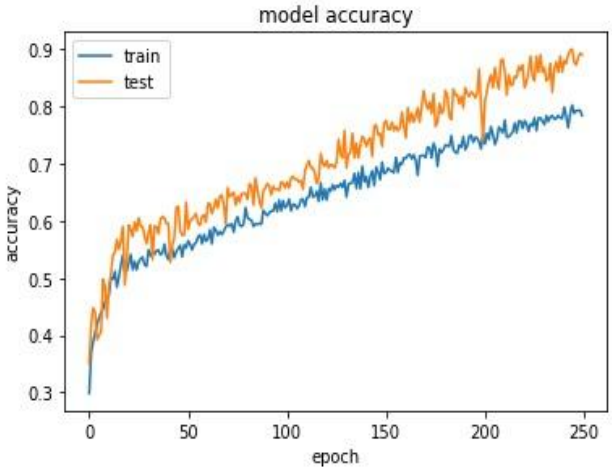

Fig.[4.1] : Model accuracy

V.RESULTS

To adjust the input required for the Hourglass frame, featured images resized to proper pixels.Collection size is

set to 4 and a maximum of 250 epoch used for the purpose of better analysis of training process. Other parameters (momentum, initial learning rate, weight decay regularization, etc.) refer to the standard parameters in the model. In the training phase, we followed the pre trained data set for training the model, then we trained after setting up training boundaries. Then for image processing we have used CNN algorithm and YOLO algorithm for video processing. With the object finding function, test results can be divided into four types, which include true positive (TP), which is true negative (TN), false positive (FP), and false negative (FN).In this context, TP represents the responsible boxes it contains crops; FP means bounding boxes that do not contain the target crops and that are wrong identified as targeted crop; and FN shows targeted crops they are not identified as crop and there are no bounding boxes created. The precision, recall and F1 score are used as the performance indices of predictive ability.Precision and recall are as follows

$$\text{Precision} = \frac{TP}{TP + FP}$$

$$\text{Recall} = \frac{TP}{TP + FN}$$

VI.CONCLUSION

Weed detection, one of the most forefront techniques, can help evolve traditional activity at another level, since it carries one of the crucial livelihood factors. Manual work eradication is an exigency in this techno-oriented world as agricultural activity is a non-terminating processhence with widespread implementation range, also enhancing the accuracy levels weed detection is highly emerging out causing an escalation of crop yields in the market. And since bestrewing pesticides directly affects the yields, this needs to be looked after at high priority Hence this deep learning technique is of ultimate use in back acres, as there is no need of segmentation of crops and weeds manually, it needs to be built with the latest algorithms and techniques and also the pre-existing techniques need to be reconstructed with these.

REFERENCES

[1].Xiaojun Jin, Jun Che And Yong Chen,Weed Identification Using Deep Learning AndImage Processing In Vegetable Plantation, Ieee 2021.

[2].A. J. Irías Tejeda,R. Castro Castro,Algorithm Of Weed Detection In Crops By Computational Vision,29rd International Conference On Electronics, Communications And Computing,2019 IEEE.

[3].Sonakshi Vij,Om Tiwari,Vidit Goyal,Pramod Kumar, An Experimental Set Up For Utilizing Convolutional Neural Network In Automated Weed Detection,2019 IEEE.

[4]. Umamaheswari S,Arjun R,Meganathan D,Weed Detection In Farm Crops Using Parallel Image Processing,2018 IEEE.

[5]. Wei-Che Liang,You-Jei Yang,Chih-Min Chao, Low-Cost Weed Identification System Using Drones,2019 IEEE.

[6]. Adnan Farooq, Jiankun Hu, Xiuping Jia,WEED Classification In Hyperspectral Remote Sensing Images Via Deep Convolutional Neural Network,2018 Ieee.

[7]. I. Moazzam ,A Review Of Application Of Deep Learning For Weeds And Crops Classification In Agriculture, 2019 IEEE

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A Survey Paper on Weed Detection

Pradnya Nikam, Kartiki Borage, Shreyash Lokhare, Shraddha More, Prof. Sinju Saliya
Department of Computer Engineering,
JSPM's Rajarshi Shahu College of Engineering,
Maharashtra, India

Abstract- Weeds are basically the plants that are not sown at a particular place, they grow naturally but they are unwanted. Weeds compete with the crops for water, minerals, light, space which eventually leads to reduction in yield of crops. So, it is important to manage and monitor them. The main objective is to develop a weed detection system based on Convolutional Neural Network (CNN) so minimum spraying of pesticides can be done on the areas of weed and maximum spraying of pesticides can be done on areas of crops. In this paper CNN technique is reviewed. In CNN models, the input image passes through series of convolution layers which has filters i.e. Kernels and apply ReLU activation to the matrix. Then pooling is performed to reduce the dimensional size and flattened output is fed into a fully connected layer (FC layer). Finally the output is classified as weed.

Keywords- Weed detection, Crops, Convolutional Neural Network (CNN), Image Processing, Machine Learning.

I. INTRODUCTION

WEED, a basic term used to describe undesirable plants/crops developed at an inappropriate location which hinders and interferes the growth of the other demanding crops.

They are of severe issue as they challenge the other wanted vegetation which in turn shrinks their quality and the quantity of their production as well. They need to be eradicated at the initial stage itself which subsides the production loss.

Secondly for the process of eradication of weeds, the orthodox method of implementing pesticides needs to be redeemed by the Deep Learning oriented model, which directs the user to identify the weed, its location and quantity of pesticide needed to be sprayed. In short it enables E farming but maximum accuracy, appropriacy and suitability.

The orthodox method involved physical labour, where each and every plant needed to be analyzed, recognized which now can be done implementing Deep learning model for detecting weeds, hence saving manual efforts, cost, quantity of pesticides as well. This technique for the weed detection is the most ultimate solution for efficient reduction or removal of chemicals in crop production.

Thus aiming to detect the weed and identify it in crops by using image processing algorithms and deep learning technique, a video of the agricultural area is given as a input to the system and hence weed detection with maximum accuracy will be processed. Image processing algorithms will be applied and the end result will give the identified and classified weed

II. LITERATURE SURVEY

For Image Processing and machine learning based classification of weeds and crops, there are several proposed methodologies.

XIAOJUN JIN [1] proposed that the precision achieved by the trained CenterNet model during the field test is 95.6%. Here vegetables were detected and bounding boxes were drawn around it and the objects which are not bounded by boxes were considered as weeds. Basically the first step performed here was image acquisition.

Here images of Chinese white cabbage were acquired for experimental purposes. Then Image Augmentation methodology was used on the collected images to fix color, brightness, rotation and 1150 images were expanded to 11500.Manual annotation was applied by drawing bounding boxes on vegetables which were used to train the CenterNet model.Then model was trained and tested to acquire desired result. According the experimental results it was proposed that this methodology is feasible for weed identification in plantation of vegetables.

Parallel image processing technique for weed detection can achieve precision of 91.1% as proposed by **Umamaheswari S [4].** The PWDS methodology is implemented using the Convolutional Neural Networks. The precision values of plant classification and weed detection were compared with the values proposed by S. Haug, J. Ostermann, and R. Bosch the paper A Crop /Weed Field Image Data set for the Evaluation of Computer Vision Based Precision Agriculture Tasks and the PWDS model has more accuracy. The use of neural network makes it more efficient because only pixels of input image are used by the system as neurons.

Use of hyper spectral data collection followed by label generation and classification is a method proposed by **Xiuping Jia[6]** where hyper spectral imaging system was used to gather images used for study which included Hyme, Alli, Azol, and Hyac. Then using data augmentation the number of images was increased by 2000 for each weed category.The CNN model consisted of 2FC layers. The configuration of architecture included convolutional layer, non linearity layer and max pooling layer. The recognization rate for 500 x 500 pixels patch size is 21.83%, for 250 x 250 is 24.43% and for 125 × 125 is 21.57% So it was proposed that 250 x 250 patch size achieves high recognization rate.

III. MOTIVATION

First and foremost the most crucial aim is to recognize and multiply the use on areas consisting of weeds. That specific area has to undergo further more operations for eradication of weeds for reusing it. Also efficiency, accuracy, suitability in real time applications has to be taken into consideration. Many weed detection projects are implemented with high accuracy but on image level. Image or the data set of images is processed based on which classification is performed, but here these come into picture- suitability and efficiency.

No doubt images do enable good accuracy lack the feasibility level. Stacking of images (video) is much more covninient, suitable than a single image. Considering the surface area, capturing and processing the images of every single plant in not feasible. Whereas one video can do the same in one go with best ac-curated results. Thus there exists motivation in all these factors

IV. PROPOSED SYSTEM

The proposed model detects the weeds from the crops. In this model some machine learning algorithms will be used along with several image processing techniques. The very first step will be acquiring the images of the field. This can be done manually or attaching a camera behind the tractor so that the real time images of the crops can be obtained.

1. Conversion of video (input) into frames:
The system doesn't understand the video as input, so we need to convert the video into number of frames(images). We need a folder to store the converted frames from the video, otherwise it creates its own folder and stores the frames. The frame creation will start from 0 value until the last frame. For conversion of the video to frame, you can either give a static video or live video.

2. Converting the image into Grayscale image:
After acquiring the images from the fields, we load the captured image of acquisition unit and do pre-processing on it. The RGB image is converted into Grayscale image. For many applications of image processing, color information doesn't help us identify important edges or other features. To save your precious time and make your life easy you can use grayscale images instead of using RGB. However, this is not true for every case. Some images might be better off getting processed with colors. But for the proposed system we convert the images into grayscale images. Then we find out the threshold image. Thresholding produces a binary image, where all pixels with intensities above (or below) a threshold value are turned on, while all other pixels are turned off. The binary images produced by thresholding are held in 2-Dimensional NumPy arrays, since they have only one-color value channel. They are Boolean; hence they contain the values 0 and 1.

3. Classification:
[9] Used CNN for the classification of weed. Neural networks are designed after our brains. They consist of layers of artificial neurons called nodes. Each node in a layer is defined by its weight values. When you give image as input data, it takes the pixel values and takes out the unique visual effects. When images are given, CNN will detect the edges of the picture, and then the definition of the image will get passed to the next layer. In the next layer, corner and color groups will be detected. After this, the definition of the image will be carried forward to the next layer and until a precision is made the cycle carries on. The main role of CNN in our model is to reduce the images into a form that is easier to process, for a good prediction.

After this, non-linearity of the images is increased by RELU. The images are naturally non-linear, so RELU is done. After RELU, pooling layer is carried out, which is another building block of CNN. The spatial size of our representation is reduced, so that the network complexity and computational cost is lowered. After this, flattening is done so that it creates a single long feature vector. This feature is used for the final classification.

V. CONCLUSION

Weed detection is one of the most promising and emerging technique in the back lands which can help develop the traditional agricultural activity exclusively. With emerging technologies and abstract implementations, the agricultural activists can ace the crop cultivation and production.

Since one of the three living necessities depends on this pursuit, it can be considered as a non extinct one with huge future scope applications. Thus manual work is now being reconstituted by the leading edge mechanization.

REFERENCES

[1] XIAOJUN JIN, JUN CHE AND YONG CHEN,Weed Identification Using Deep Learning and Image Processing in Vegetable Plantation, IEEE 2021.

[2] A. J. Irías Tejeda,R. Castro Castro,Algorithm of Weed Detection in Crops by Computational Vision,29rd International Conference on Electronics, Communications and Computing, 2019 IEEE.
[3] Sonakshi Vij, Om Tiwari, Vidit Goyal, Pramod Kumar, An experimental set up for utilizing convolutional neural network in automated weed detection, 2019 IEEE.
[4] Umamaheswari S,Arjun R,Meganathan D,Weed Detection in Farm Crops using Parallel Image Processing, 2018 IEEE.
[5] Wei-Che Liang, You-Jei Yang, Chih-Min Chao, Low-Cost Weed Identification System Using Drones, 2019 IEEE.
[6] Adnan Farooq, Jiankun Hu, Xiuping Jia,Weed Classification In Hyperspectral Remote Sensing Images Via Deep Convolutional Neural Network, 2018 IEEE.
[7] Moazzam ,A Review of Application of Deep Learning for Weeds and Crops Classification in Agriculture, 2019 IEEE.

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Real-Time Object Measurement Using Image Processing

Prof A. Golande, Ashutosh Panda, Yash Basutkar, and Sukesh Jiwane
sukeshjiwane30@gmail.com

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Abstract

From an industrial standpoint, real-time object measurement and dimensioning is a crucial component of the requirements of the current and developing world. When dealing with computer vision challenges, these are the topics that must be tackled. This paper shows how an IoT video device, such as a camera, may also be used to recognize objects and compute their real-time measurements. Based on NumPy, OpenCV libraries, and cameras we proposed an IoT-based real-time object measuring technique for calculating measurements and dimensions of objects. Many modules and algorithms from OpenCV are used in this project. There are five stages to this technique, which are as follows. Capture a picture , Measurement of an object , Calculating the area, Saving the output, Displaying the Measurements.

Keywords: - Object measurement, Area Calculation, Image Processing, Canny edge detection.

Introduction

The real-time object measurement system is a program for detecting the dimensions of objects in real-time. There aren't many real-time object measuring models out there, so this method of measuring and dimensioning an object in real-time that we've proposed here has a lot of potentials. This is a critical characteristic of an issue in computer vision. As indicated, this project depicts a real-time approach for calculating measurements of the objects from images taken by the user. It identifies the object using a webcam and hovers its dimensions in real-time, including the area, in the appropriate units of measure. We created a system that uses the OpenCV software package to implement the proposed technique.

Automated technology relies largely on numerous sensors and cameras, and it also has gained a lot of traction in recent years. Running robots necessitates far too much automation. It's also important to figure precisely where an object is, how tall it is, and how wide it is. We learned how to measure the size of an object using IoT devices like a webcam and OpenCV in this project.

This system has various benefits, including being highly effective in the industrial field and simplifying human work.

1.1. Related Work:

Recently, much research has been done on this topic, and several researchers have published their findings.

The YOLO algorithm, created by Joseph Redmon et al., uses CNN-based visual processing to recognize real-time objects. Its method is based on a few variables and is extremely quick and easy to implement. [1]

M. Naveen Kumar et al. presented the OpenCV implementation including Python and MATLAB. This research makes use of a CUDA-based GPU interface. OpenCV is now available for Windows, Android, and a variety of other platforms. This study now introduces OpenCV Robotic methods. [2]

The LiDAR Imaging System, developed by Santiago Royo et al., works in both 2D and 3D settings. This research looked into the various LiDAR system configurations available for self-driving automobiles. The development of new imaging techniques, scanners, and detector arrays is the key strategy.[3]

Zarine Abdelmoghit devised many real-time object detection methods. They used a stereo camera to accomplish their goal. The distance between two objects is detected and quantified using this method. [4]

Edge published Detection with Embedded Confidence, in which he elaborated on a core module in many computer vision operators that compute the heavy measure of the pixels in a frame. Meer, P., Georgescu, B.: The procedure is stated, in a linear space, emphasizing the importance of the many subspaces. [5]

A study on updated canny edge, presented by LiSheng Ding, looks over the theory behind the primitive canny edge thus, improves in location accuracy and has a more perceptible de-noising effect, according to the trial. [6]

2. Proposed Methodology

The system is primarily based on the use of Canny edge for detecting the edges and contouring part of an image given as an input, OpenCV for image processing and reading images from the system via an external webcam, and NumPy for rapidly and accurately formulating mathematical computations and determining the measurements of the desired objects placed within the constraints.

Noisy Image Canny Filter σ = 1 Canny Filter σ = 2

Fig. 1 Canny Edge Filtration

2.1. Measurement and calculation of the dimensions:

The canny edge can precisely locate the edges and the vertices of the object placed within the periphery of the system. This provides the values for (X1, X2) and (Y1, Y2) respectively which are then taken as an input for implementing $\sqrt{((X2 - X1)^2 + (Y2-Y1)^2)}$. The system uses this formula for calculating the length and width of the object which are then used for calculating the area of the object.

https://doi.org/10.17762/msea.v-i-.-

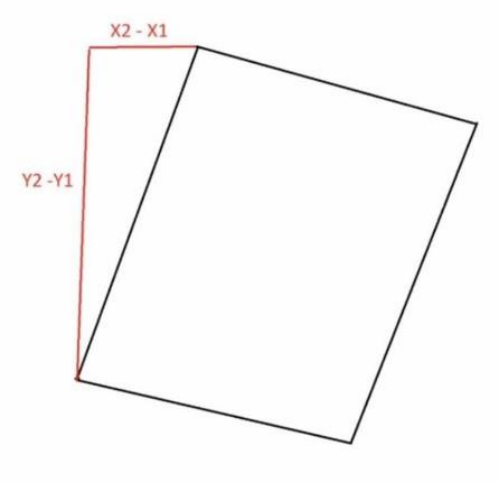


Fig.2 Diagram representing the formula used.

Object's length or width =

$$\sqrt{((X2 - X1)^2 + (Y2-Y1)^2)}$$

2.2. Implemented Algorithms

1. Noise reduction

Applying Gaussian blur to the image is one technique to smooth it out and get rid of the noise.

$$\frac{1}{2\pi\sigma^2}\exp\left(\left(-\frac{(i-(k+1))^2 + (j-(k+1))^2}{2\sigma^2}\right);\right.$$

$$1 \leq i, j \leq (2k+1)$$

2. Gradient calculation

The Gradient calculation step analyses the edge strength using the edge-finding algorithms to calculate image grading.

$$|G| = \sqrt{Ix2 + Iy2}$$

$$(x, y) = \arctan\left(\frac{Iy}{Ix}\right)$$

3. Non-maximum suppression

This approach looks for pixels with the greatest value within the edge directions throughout all positions on the gradient intensity matrix.

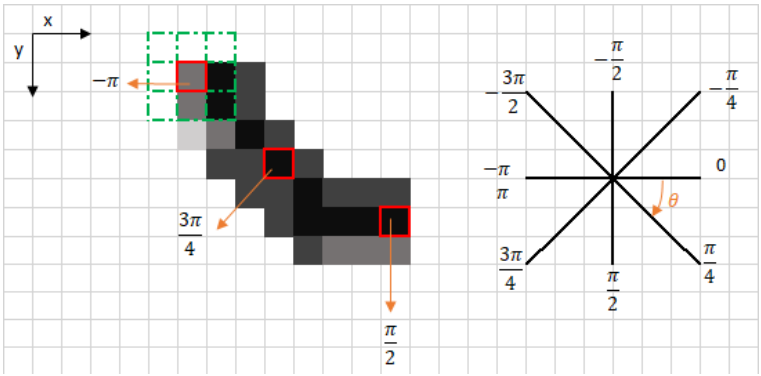


Fig.3 Non-maximum suppression

4. Double threshold

The double threshold approach attempts to distinguish between three main types of pixels: strong, weak, and unrelated.

5. Edge tracking with Hysteresis

Unless at least one pixel around the processor is strong, hysteresis converts weak pixels into solid ones based on the threshold of the results.

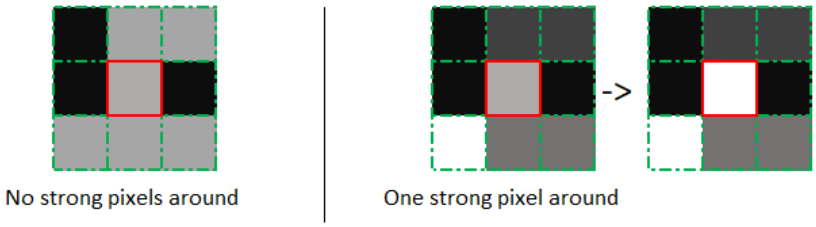


Fig. 4 Edge tracking with Hysteresis

3. Procedural Explanation

- We require libraries available in python namely OpenCV and NumPy.
- Further, a flag chunk of code to turn the webcam on or off which will contain a boolean value either “True” or “False”. "webcam = False," for example. Record the video. Set the Width, Height, and Parameters.
- In PyCharm or any other IDE, download the OpenCV and NumPy requirements. Import NumPy as np and OpenCV as cv2.
- As a result, the settings are complete. Then create the code that will be used for the measurement of the object in the image.
- To obtain real-time object measurement, a python file (utlis.py) recognizes contours and applies methods to picture input as code.
- The image is disturbed after dilation and deterioration.
- Generate a duplicate of the input image. To make the process of creating a canny image move as smoothly as possible, use dilation and erosion effects.
- The background provided to the system must be a white paper or it is equivalent and rectangular, the filter being applied should also be a rectangle similar to the white background.
- After finalizing the right contours with the Canny Edge Detector Algorithm along with the addition of the length and area to the objects within the resulting output, the white paper detection is specified.
- The system uses mathematical concepts and an illustration that measures the object that has been placed on white paper with the help of a mathematical formula and finds out the measurement of the object.
- It finds out the length, width, and area of the particular object which is present in the image and afterward denotes it over the image.

- The system uses arrowed lines and text to represent the object's dimensions, which are its length, width, and area over the image.

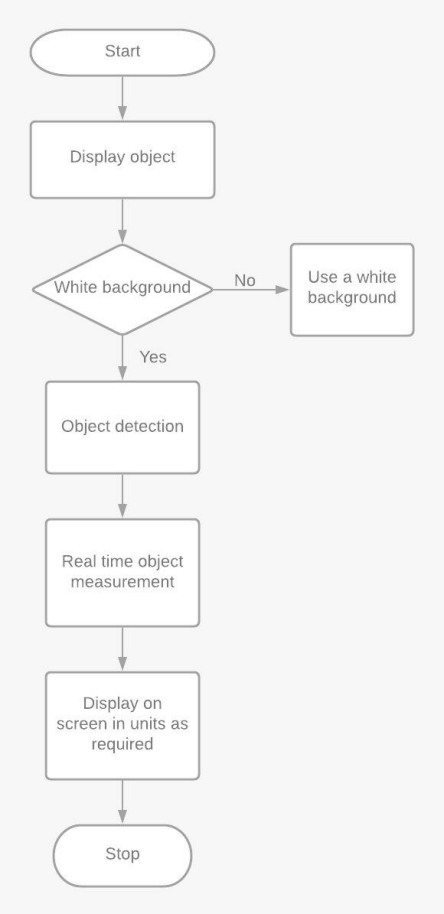


Fig. 5 Block drawing for Real-Time Object Measurement System

4. Experimental Analysis

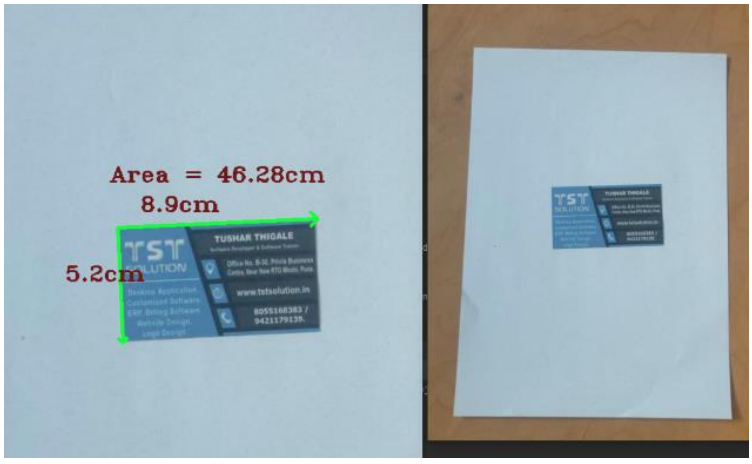
On conducting several tests on numerous objects our system was able to achieve an accuracy of 96.9% which is higher than any other object measurement and detection model previously developed.

Paper	Algorithm	Accuracy
Relative Performance Analysis of Edge Detection Techniques in Iris Recognition System	Canny for edge detection.	91.56%
Relative Performance Analysis of Edge Detection Techniques in Iris Recognition System	Sobel for edge detection.	79.40%
Relative Performance Analysis of Edge Detection Techniques in Iris Recognition System	Prewitt for edge detection.	76.10%
You Only Look Once: Unified, Real-Time Object Detection	Bounding Box Prediction.	78.60%
Real-Time Object Measurement Using Image Processing	**Canny edge detection for object measurement.**	**96.90%**

Table 1: Previously Tested Algorithms

5. Results

After running the system there comes two images as the output, with one being the original and the other with the measurements and dimensions displayed as an output. The original image is the image that the user has uploaded to the system. The result of the measurements of the objects is present below.



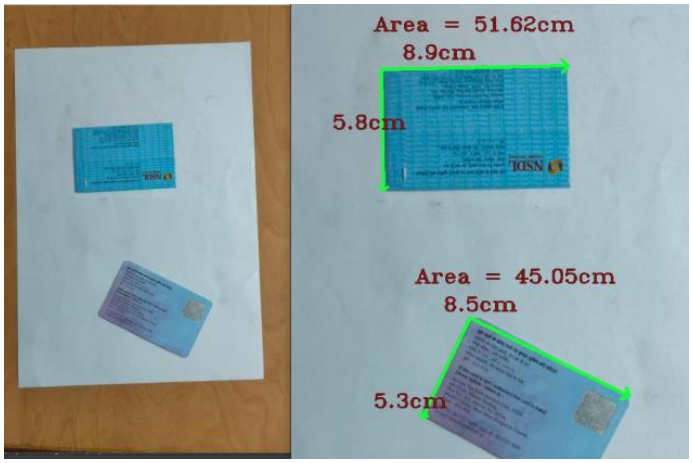


Fig. 6 Displayed Output of the System

6. Conclusion

This method can lead to many developments in various sectors prone to human errors caused during dimensioning and taking measurements. It depicts the proportions of objects within an image taken from a live video frame. Using a Canny edge detector, the dimensions are appropriately identified. This method is easy to use and has a variety of benefits and remarkable features that can be used in the real world.

7. References:

[1] Erhan D, and C. Szegedy. Scalable object detection using deep neural networks. In CVPR, 2014 IEEE

[2] R. Girshick, and J. Malik. In CVPR. 2014 IEEE Conference on, pages 580–587. IEEE, 2014.

[3] J. Uijlings, and A. Smeulders. Selective search for object recognition. International journal of computer vision, 104(2):154–171, 2013.

[4] Hariharan B, Arbelaez P, Girshick G, and J. Malik. Detection and segmentation pages 297–312. Springer, 2014.

[5] J. Yan, Z. Lei, L. Wen, and S. Z. Li. The fastest deformable part model for object detection. In CVPR, 2014 IEEE Conference on, pages 2497–2504. IEEE, 2014.

[6] C. L. Zitnick and P. Dollar. Edge boxes: In Proceedings of the CVPR pages 391–405. Springer, 2014.

[7] Navneet B, Rama C, and Larry D. Soft-NMS–improving object detection with one line of code. In ICCV, pages 5561–5569, 2017.

[8] Zhaowei C and Nuno V. Cascade R-CNN: Delving into high-quality object detection. In CVPR, pages 6154–6162, 2018.

[9] Jiale C and Xuedong L. Hierarchical shot detector. In Proceedings of the ICCV, 2019.

[10] K. Jeong and H. Moon, “Object Detection Using FAST Corner Detector Based on Smartphone Platforms”, First ACIS/JNU International Conference on Computers-Networks Systems and Industrial Engineering (CNSI), pp. 111 - 115, May 2011.

[11] Liang C, George P, and Alan Y. In Proceedings of the ICCV, 40(4):834–848, 2017.

[12] Terrance D and Graham T. Improved regularization of convolutional neural networks with CutOut. arXiv preprint arXiv:1708.04552, 2017.

[13] Kaiwen D, Song B, and Q Tian. internet: Keypoint triplets for object detection. In Proceedings of the ICCV, pages 6569–6578, 2019.

[14] Glanz Ghia, and Quoc V Le. In Proceedings of the CVPR, pages 7036– 7045, 2019.

[15] Ross Girshick. Fast R-CNN. In Proceedings of the ICCV, pages 1440–1448, 2015.

[16] Bharath Hariharan, and Jitendra Malik. Hyper columns for object segmentation and fine-grained localization. In Proceedings of the CVPR, pages 447–456, 2015.

[17] G. Brodsky and A. Kaehler, “Learning OpenCV Computer Vision with the OpenCV Library" in, Sebastopol, O’Reilly Media, 2008.

[18] Aydin and Othman N. In IDAP, pp. 1 - 6, 2017.

[19] Othman N, and I. Aydin. In CICN, 108-112, 2017.

[20] Abhinav Shrivastava, Abhinav Gupta. In Proceedings of the CVPR, pages 761–769, 2016.

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