EARLY DETECTION OF FOREST FIRE USING DEEP LEARNING

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LITERATURE SURVEY:

1. EARLY DETECTION OF FOREST FIRE USING DEEP LEARNING :

AUTHORS :

Medi Rahul , Karnekanti Shiva Saketh , Attili Sanjeet and Nenavath Srinivas Naik.

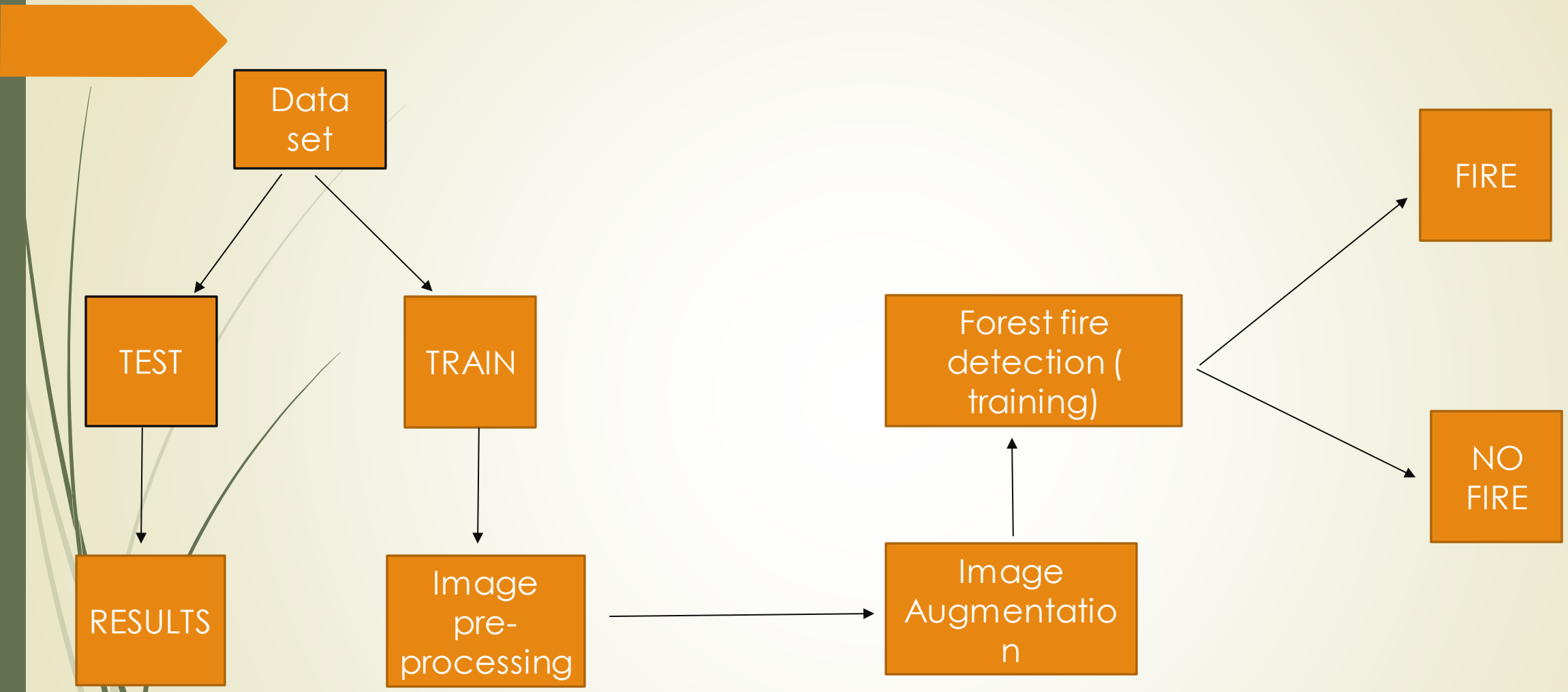
Department of Computer Science and Engineering , International Institute of Information Technology

(IIT) Naya Rajpur , India.

OBJECTIVE :

The objective is to detect the forest fires in its early stage. For the early detection of the forest fire ,we proposed an image recognition system method based on Convolutional Neural Network (CNN).

PROPOSED MODEL:



METHODS:

- The system invloves the pre- processing the image data and applying data augmentation such as shearing, flipping etc.
- We then use models like VGG16 , ResNet50 , annd DenseNet121 for the classification of images.
- The model initially divide the train and test sets in 80% and 20% and then sent to the pre processing phase , where finally it is trained to classify into two classes fire and non- fire.
- It uses ResNet50 with transfer learning to train the model and then they are resized and splitted up into train and test sets.
- ReLu function and softmax are used for image classification .
- By using the optimal learning rate the proposed model was able to achieve a training set accuracy of 92.7% and est set accuracy of 82.57%.
- Image pooling and all the working are taken care by the ResNet50 architecture and classified based one the threshold by softmax int two classes 0(fire) and 1 (no fire).

RESULT:

VGG16 Test Case Results

Test Condition	Result(Accuracy)
Adam optimizer without momentum	74.52%
Adam optimizer with momentum = 0.9	82.73%
SGD optimizer with momentum = 0.9	85.21%

RESNET50 TEST CASE RESULTS

Test condition	Result(Accuracy)
Adam optimizer without momentum	87.37%
Adam optimizer with momentum = 0.9	89.92%
SGD optimizer with momentum = 0.9	92.27%

2. DEEP LEARNING APPLIED FOREST FIRE DETECTION:

AUTHORS:

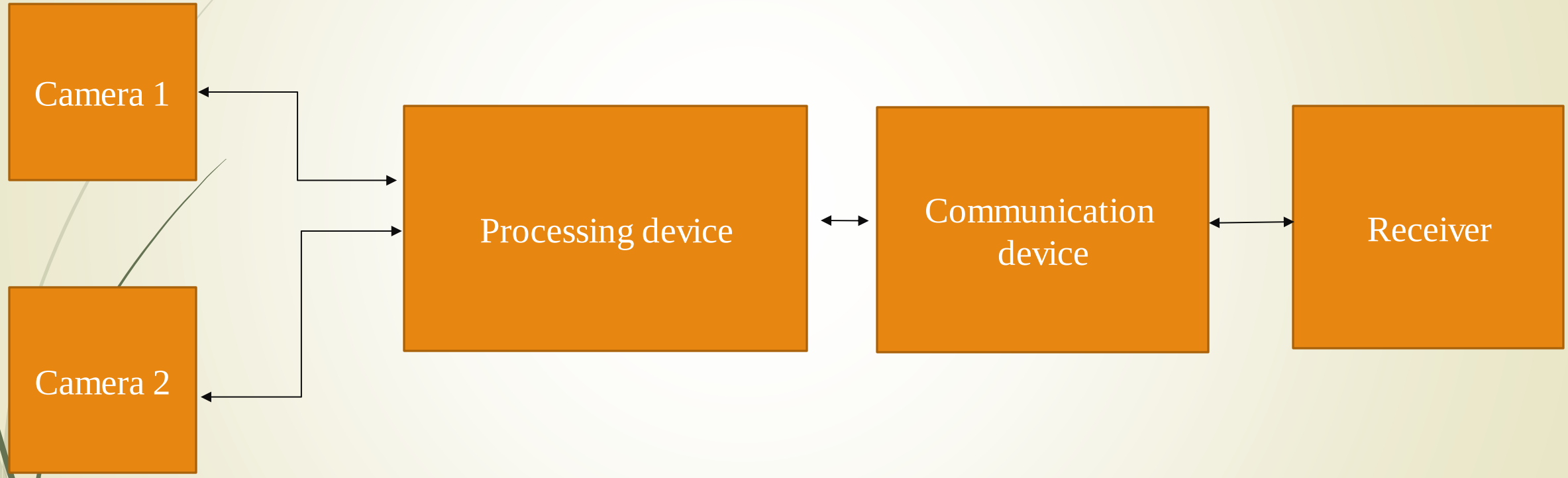
Byron Arteaga , Mauricio Diaz , Mario Jojoa. University of Naino pasto , Colombia .

2020 IEEE International Symposium on Signal Processing and Information Technology.

OBJECTIVE:

The lack of early detection mean has been evident in the events that have occurred in recent last fires and it can be concluded that there are not enough measures to counteract this problem.The purpose of this article is to evaluate the performance of different CNN models pre-trained in the classification of forest fire images , which can be applied in economic development cards such as Raspberry.

PROPOSED MODEL:



DATA PROCESSING:

METHODS:

- The data processing was done through open source programming language Python, the cloud service Googel colab and deep learning algorithms using Pytorch's library.
- After the data augmentation and pre- processing the training image , three types of transformation takes place the cropping of image, rotating of image and normalizing of the image.
- The classification of image is done by using the pre-trained models of ResNet and VGG pre-trained models.
- To validate the performance of each pre-trained model he k-fold method is used.
- The model obtained during the validation is sent to the Raspberry to test their functionality
- For testing in Raspberry the google colab saves the model In old Pytorch's library.

RESULT:

RESULTS FOR PROPOSED MODELS FOR FIRE IMAGE CLASSIFICATION:

TITLE	PROPOSED MODEL	FALSE POSITIVES	ACCURACY
Deep learning applied to forest fire detection	Resnet18	0.2%	0.9950
Energy- efficient deep CNN for smoke Detection in Foggy IoT Environment	VGG-16	2.3%	0.9772
Convolutional Neural Networks Based Fire Detection in Surveillance Videos	GoogleNet	0.054%	0.9446

3.A REAL-TIME FOREST FIRE AND SMOKE DETECTION SYSTEM USING DEEP LEARNING

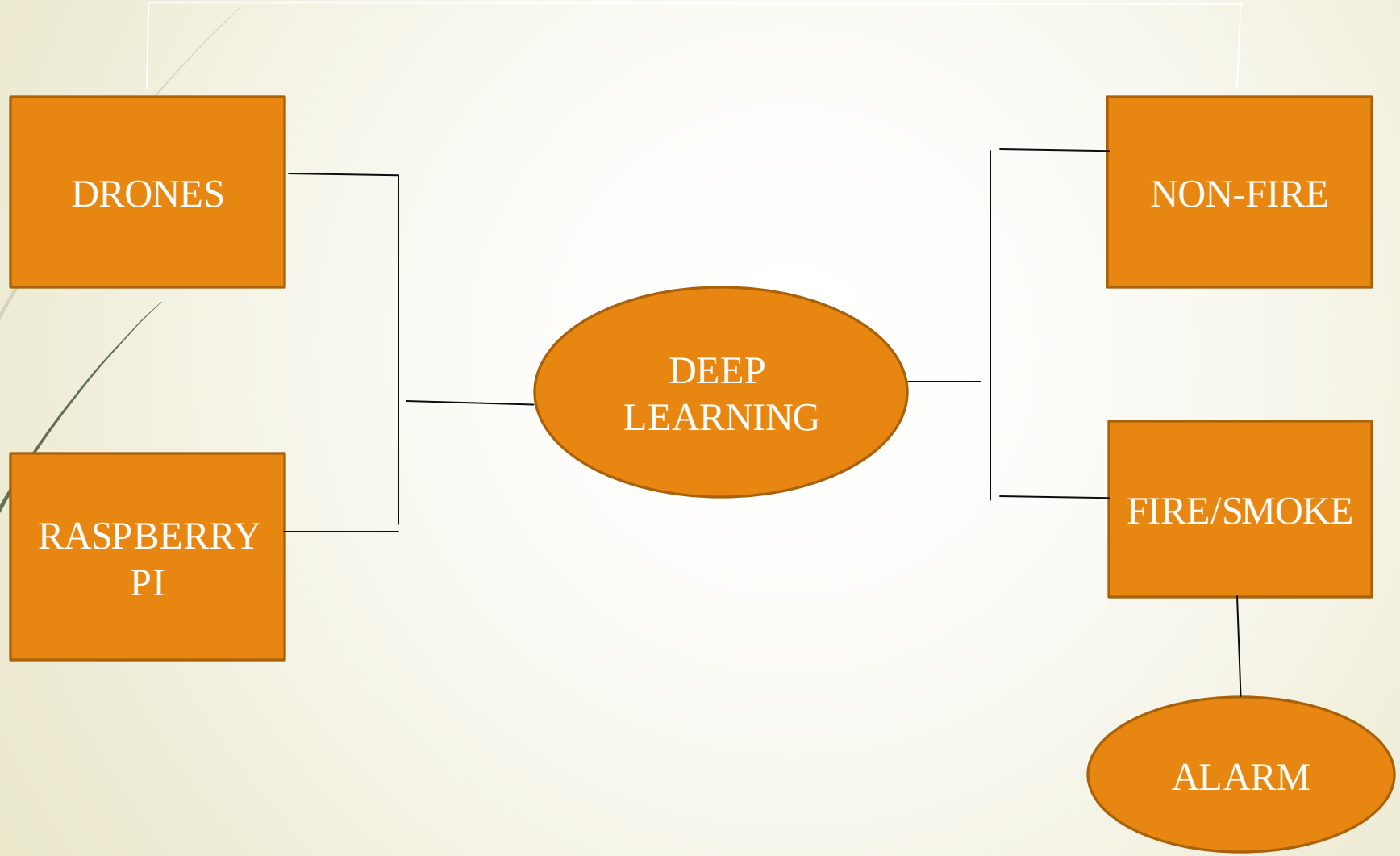
AUTHOR:

Raghad K.Mohammed (Department of Basic Sciences, College of Dentistry, University Baghdad, Baghdad, Iraq).

OBJECTIVE:

Forest fires happens for every month around the globe .They are costly to the society and causes serious damage to the ecosystems. Fire and smoke have various colours,textures and shapes, which are challenging to detect.For this deep learning technology is used using transfer learning to exract features of forest fires and smoke.This is deployed on a Rasberry Pi device with the camera.

PROPOSED MODEL:



METHODS:

The proposed framework aims to detect smoke and fire based on the images received from the video stream from the Raspberry Pi

1. Pre-processing of image data.
2. Image data augmentation (Scale, horizontal flipband vertical flip).
3. Pre –training model imagenet dataset ->{inception-ResNet-V2}.
4. By fine tuning the above two steps we have to send that to the fully connected layer with softmax.
5. we can view the model accuracy as instead.

RESULT:

PREFORMANCE MATRICES	VALUE
Accuracy	99.09
Precision	100.00
Sensitivity	98.08
F1-Score	99.09
Specificity	98.30

4.FIRE DETECTION USING DEEP LEARNING

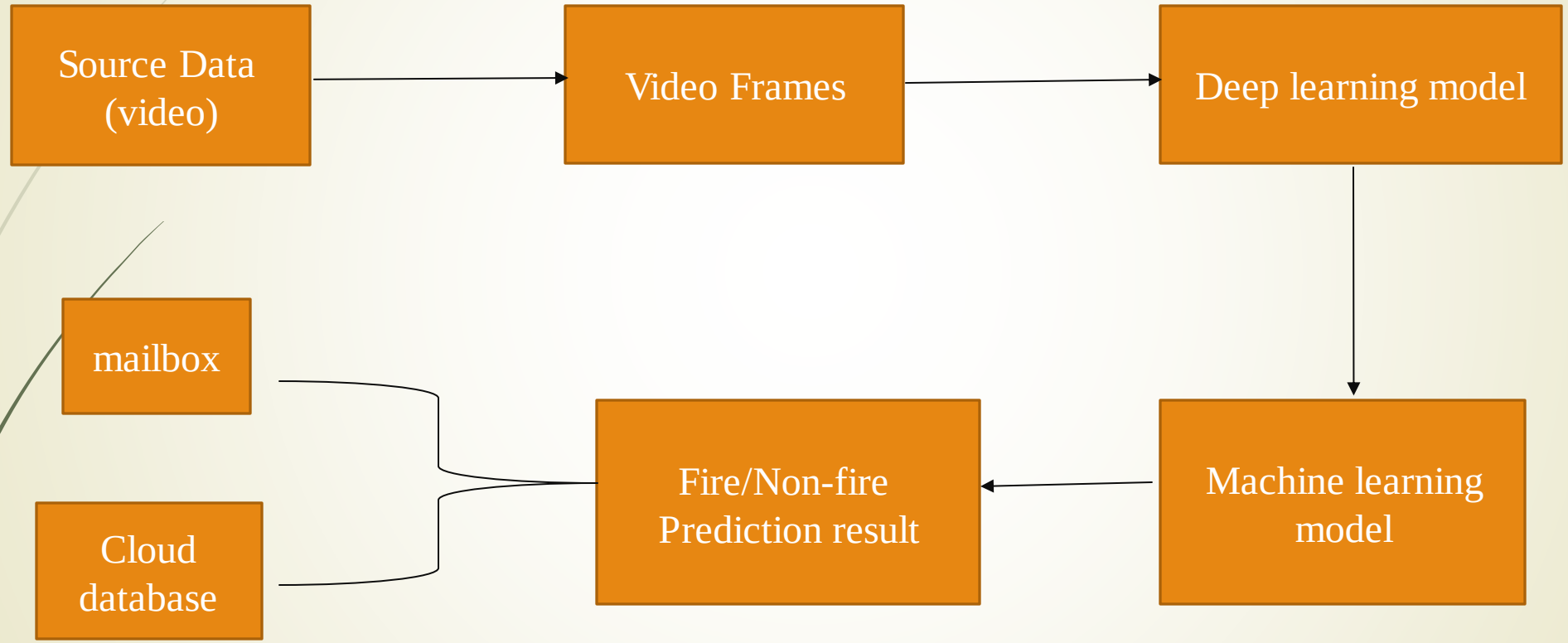
AUTHOR:

Suhas. G , Chetan Kumar, Abhishek. B.S , Digvijay Gowda. K.A , Prajwal. R . Student of Department of Computer Science and Engineering , Maharaja Institute of Technology Mysore , Karnataka , India.

OBJECTIVE:

Fire sprawling urbans to dense jungles , fire accidents pose a major threat to the worls. These could be prevented by deploying fire detection systems.In this work , we endeavour to make a stride towards detection of fire in videos using Deep learning.

PROPOSED MODEL



METHOD:

1.The model is divided into two parts

a. Data collection and Pre-processing.

b. Building fire detection model by transfer learning.

2. It develops a classification model using deep learning and Transfer learning to recognise fires in images/video frames.

3.The first step is to gather video frames and it should be divided into two classes fire and non-fire. The collected dataset is divided into train and test sets.

4.The second step is to extract the video features of pre trained models using keras.

5.We have used ResNet-50 , Inception V3, and InceptionResNetV2 models to extract the features and various ML algorithms on the extracted features to detect fire in video frames.

RESULT:

- The aim of our work was to develop to an application capable of detecting fire in videos and images.
- We have experimented with the various deep learning models and classification models and have selected ResNet-50- SVM for implementation as it offered the best performance metric values.
- The accuracy , precision and recall values for this combination was 97.8%,97.46% and 97.66%.
- It was able to identify fires in all of the twelve test fire videos.
- It is affordable, robust, reliable and provides high performance without the need for setting up a dedicated infrastructure.