# Survey on Forest wildfire Detection Based On Cloud And Fog Computing With Energy Management Using Machine Learning Techiques

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*Abstract-* *Cloud is the computing paradigm that enables a on-demand network service. Shared pools of configuration resources like a storing data, service etc. Fog is emerging technology that extends communication facilities towards an edge computing. It plays a vital role in energy consumption than the cloud. In additional machine learning approach are used to find a accuracy data in real time monitoring scenarios. The main focus of this paper is how to prevent a wildfire in forest area to detect initial stage and recoverit. In this survey, a brief discussion on energy management carried out on cloud and fog computing. The main idea of this article is understanding both cloud & fog paradigm and machine learning techniques are mentioned here.*

*Keywords-* Forest wildfire, Cloud computing, Fog computing, Energy management, machine learning techniques.

## I. INTRODUCTION

Forests are natural resources in our country. It should be protected by human beings. Because it is precious one in the environmental. Now a day lot of disaster is destroying the forest areas. Wildfire gave a greater damage to all wild animal cause a forest wealth affect the human life such as home property etc..In order to avoid the disaster manually as well as technically and to protect before itself, with the help of 24/7 monitoring and preventing the forest without any damage.

Cloud computing is the centralized resource. Cloud computing are service based for the end user. There are three main services such as IaaS, PaaS and SaaS. All the commercial industries like Amazon flipchart are using cloud computing. Because the user produces lot of data with billions of information which cannot stored in our pc. Cloud computing gives a lot of service within online mode and affordable price also. Main advantages for cloud user are **"PAY AS U GO"** manner charges for pay for usage of data. Some drawback are also there. But still using it.

At present another merging technique is fog computing. Fog computing plays a vital role in society. Because it have a lot of merits when it compares to the cloud computing. In fog computing storing and retrieving process are so fast. For example Small industry is not having a maximum data, so fog paradigm is very useful for those companies. Data are stored in data centre. Data centre are small is size. Giving more benefits to the end user low latency reduced network bandwidth mobility heterogeneity security low energy consumption geographical distribution. Fog computing is very useful in an emergency spot. Because cloud is too far and facing some difficulty in storing data retrieve process traffic security aspects third party plugin .These drawback are overcome with plenty of advantages in fog computing that involves main fields like medicinal surveillance camera traffic vehicle to vehicle communication forest fire monitoring and prediction etc.

Energy management is used to control power consumption for all computing resources. Using cloud computing user can manipulate and stores data in the data centre. It requires more energy to handle the data centre. By using fog computing energy is saved to the maximum in all sources of work like uploading, downloading, storing, traffic etc. Energy management is useful for accessing zero net energy [ZNE] in all resource domains. So in this paper work the mainfocus will be on how the energy is efficiently used in both cloud and fog paradigm and then forest wildfire monitoring and predicting at early stage by using machine leaning techniques.

The rest of the paper is organised as follows .Section 2 talks on literature reviews for forest fire in early stages of the various techniques. Section 3 the energy management and machine learning techniques.Section 4 Existing proposed work to detect a forest wildfire in various techniques. Section-5 Conclusion of an article.

## II. LITERATURE REVIEW

Joaoalves@etal[1]proposed system classifies the process of an image based on fire .The proposed techniques are deep convolution neural network with machine learning [ML]. The performance of both day and time gave better accuracy error rate [i.e.] day time-94% night time-94.8%. Comparing a day and night results, night gave a more accuracy than day. In future proposed work will be developed within drones mobile application etcPradeepkumarsingh@et.al. proposed system is wireless sensor network .The proposed techniques convolutional network. The performance metrics is evaluated by FWI with moisture contents in weather. In this paper cluster based approach is also involved.So, it increasesthe lifetime of network. Let us consider if the sensor node is in small size then the transmission of data is not possible inall weatherclimate. KhanMuhammad@et.al proposed system is based on convolutional neural network [CNNs]. The techniques used forsurveillance video was based on googlenet architecture .The performance metrics are classified into two classes.They are 1.fire on class 2. Normal class.The overall accuracy will be 95.7%. Thus, the proposed work is too cost effective manner. Vladimirshersty@et.al proposed architecture will be unmanned air vehicles. The techniques used are remote sensing methods. The metrics are the multi-UAV based system flight Cerlingupto to 2000 cm. Speed about 90 km/hrs with 5 kg and the process of duration is 2.5-3 hrs. The proposed work gives good response will high efficiency in forest fire prediction . Mdiftekharul@et.al proposed system that safe from fire [SFF] which involves the multiple sensors by MCU board. The proposed techniques are based on fuzzy logic basics. The performance metrics are slow in process. Becausefuzzy logic takes more time to conclude theresult. Accuracy of SFF system is 95%. Consider these fuzzy logic algorithm gave bad experimental result to find an early stages of forest fromfire.

KhanMuhammad@et.al proposed system are based on convolutional neural network [CNNs].The proposed mechanism is an adaptive prioritization in surveillance camera. The performance gave good accuracy with minimal false alarm. These works gave a reliable transmission under surveillance camera which can avoid a great disaster caused by fire. Consider this proposed work gave good accuracy. But some drawbacks are taken place in security side example process authenticationSebastienfrizzi@et.al proposed system that involved in classification manner. The proposal approaches arebased on convolution neural network [CNNs]. The performance metrics are detecting the speed of fire and increasing the prediction.Accuracy of classification is 97.9%. In future this work will be enhanced in 3D convolutional and

this proposed work will detect only red colour fire. In additional this work will be used to detect all colour of fire example [RGB].Qi-Xingzhang@et.alproposed system to detect a wild forest fire based on feature extraction manner. The proposed techniques are R-CNN. Using synthetic smoke the performance metrics are better when it compared to normal CNN. The accuracy of detection rate is 93.67%. Consider, this proposed work will boost the synthetic method of forest smoke images &video sequence. Mamatadutta@et.al proposed system are based on wireless sensor network [WSN] .The proposed techniques are fuzzy logic basis. The performance metrics are calculated by using fuzzy. The accuracy is 91.94%. Let'sconsider this proposed work willnot show the accuracy in correct time. Thus it is not suitable for real time scenarios .Devadevan@et.alproposed the architecture which is based on wireless sensor network [WSN]. The proposed techniques are energy efficiency with routing protocol .The performance metrics is better suitable in adaptive periodic threshold sensitive energy sensor network [APTEEN]. For forest fire detection it consumes less energy. Consider this work is lacking in security aspects and wants to improve in routing protocol in location base in order to detect a forest fire as soon as possible.

Iiyeqian@et.a1proposed architecture to detect early forest fire based on two steps. One step is time delays and analyse the smoke spreading. Two protocols are focused on motion feature in smoke style and the area change in motion style. The proposed techniques are Gaussian mixture model in video base. The performance metrics involves both weathers like sunny and foggy .The accuracy of foggy weather condition is 78.5% and accuracy of sunny weather condition is 92.2%. Consider this proposed work will be effective for this experimental scheme.Anupammittal@et.al proposed system is based on machine learning. The proposed techniques is wireless sensor network [WSN]. The performance metrics are used to classify the data. In futurethis proposed work will be very useful in real time environment. But delay in transfer of data which depends a node that is in wakeup sleep mode or network error. Chiyuvan@et.a1 proposed system are UAV in computer vision based .The proposed techniques are histogram based segmentation. The performance metrics are taken under both feature of brightness and motion in IR images. These work gave a good accuracy with reliability in fire detection. In future, this proposed work will be extended to combine IR images and visible range image to reduce the false alarm rate in fire detection. S.anand@et.al proposed system is forward neural network [FNN] .The proposed framework is vertex-5.The performance metrics are consists the multi sensor for predict a fire .The implementation costs is too low and gave a betterl improvement in finding a forest fire. Consider, this proposed work will be effective in all

manners. It enhances the detection of forest wildfire. Yingshuping@et.al [15] proposed work is deep learning features .The proposed techniques are feature extraction with image processing. The performance metrics is classified intosequenet1, 2 and 3 with selected candidate region for detecting a smoke. Accuracy of smoke detection in various field uses 97.124%,89.41. In future, this work will be based on motion algorithm selection.In small hardwarearchitecture, will show more accuracy result and improves timeperformance.

## III. THE ENERGY MANAGEMENT AND MACHINE LEARNING TECHNIQUES

### THE ENERGY MANAGEMENT

Energy management are used to control and reduce energy consumption in the resource environment. It leads the path to reduce the cost .The main objective of energy management is to increase the profit and decrease the cost. It should be good in energy efficiency. In Machine learning, manipulating the time is minimal and the rate of accuracy is better when comparing to other technology.

### MACHINE LEARNING TECHNIQUES

Machine learning is a application of artificial intelligence. It provides systems the ability to automatically learn and improve from experience without human being. The main aim is to allow the computers to learn automatically without human and adjust actions accordingly. It also focuses on the development of computer programs that can access data and learnfrom themselves. There are three types of machine learning, they are.

**1.SUPERVISED LEARNING** It is most popular in machine learningmethod. It is easy to understand &simple way to implement. It is task based oriented. It is highly focusedon singular task.

**2.UNSUPERVISED LEARNING**It is opposite to supervised learning.It is intersectingwith a majority of data in this world is unlabeled. It is easy to understand & much simple way to implement. The feature has also no labels.It is based on the data and its properties. The unsupervised learning isthe outcome ofthe taskswhich are controlled by the data.

**3.REINFORCEMENT LEARNING**It influences from the fields of neuroscience and psychology.It is unique and different when compared to supervised and unsupervised learning. A learning algorithm involves in any environment and then it will make a lot of mistake at beginning stage

itselfFor ex: In realtime world, video games, resources management etc.

## EXISTING WORK TO DETECT A FOREST FIRE IN VARIOUS TECHNIQUES

| S NO | AUTHOR NAME | PROPOSED WORK | TECHNIQUES WITH ANNOTATION | ACCURACY | DRAWBACK |
|---|---|---|---|---|---|
| 1. | RobiralA.sowah@et.al | CNN with fuzzy logic | Fuzzy logic with multi sensor to detect fire in efficient manner. | 90% | Fuzzy logic takes more time to calculate the data with accurate result. |
| 2. | George E.sakr@et.al | sum | Machine learning with sum aims to reduce a monitor prediction in all sources. | 96% | Limited amount of data are only performed. |
| 3. | Yongming@et.al | Pso-svm | It improves performance rate with optimization. | 98.18% | Manipulate all sets of data with accurate rate with delay. |
| 4. | Fmanimhossain@et.al | ANN | Flame and smoke are both detects from an image with reliable features. | 84.8% | The temporal process of feature lacks in this method. |
| 5. | P.srinivasaroa@et.al | deep can | To detect a fire in patch level. | 82.8% | Architecture takes too much time to detect the fire |
| 6. | Shuozhang@et.al | Sound spectrum | To find a fire with wireless acoustic Detection system classifies a crown & surface fire. | 70% | Implement leads to failure in rainy or unconditional weather or storm. |
| 7. | Raj vikram@et.al | Semi supervised classification | This technique of data leads to increases the lifetime of network & data transmission. | 90% | This work has high deployment cost. |
| 8. | Kethavathsrinivas@et.al | CNN and fog computing | By using fog, reduces time and quick response. | 95.07% | Proposed work is leads to authentication secure. |
| 9. | Faisal saeed@et.al | can | To detect fire alarm rate, the model given is more accurate. | 91.9% | It is suitable for a crown fire and it doesn't suitable for surface fire. |
| 10. | Zhenjiang jiao@et.al | Algorithm YOLOV3 &UAV- based | Using ova, transmission of data is done quickly. Computing tasks from cloud to edge, energy taken by whole system will be 30% to 40%. | 83% | Proposed work includes cloud .so, cloud has drawback in data transmission like[traffic bandwidth] etc. |
| 11. | Haze m. raafat@et.al | IOT sensor based on fog computing | The proposed system consists of 4 types of sensor & reaches the maximize accuracy of 4[high temperature, co2, humidity]. | 96.49% | Minimal features are taken for proposed work. |
| 12. | Vladimir sherstjuk@et.al | Neural network | The features like flame & smoke are taken for recognition. In additional, monitoring work are given to ova. | 97% | The work will be more efficient in any time; night time & smoke are not correctly detected. |
| 13. | Arum singh@et.al | Deep can | The method used to extract a smoke feature that is classified. | 94.75% | The work will be involved ina video based but it doesn't give accurate detection. |
| 14. | Wilamebenzekir@et.al | Wan with deep learning [DL] | Deep learning gives accuracy. | 99.77% | This method is more efficient for ground fire but not for other type of fire. |

These are the existing system for forest wildfire monitoring and prediction by using various machine learningtechniques.

## IV. CONCLUSION

Both cloud and fog computing are used to communicate with edge on network. Here, focusing wildfire detection in forest. In recent years, fog computing are the emerging platform for communication[i.e] data transfer from one place to another and machine learning techniques are used to manipulate the data and gives accuracy in better level. In

future considering this proposed work will give better solution for finding a wildfire at initial stage.

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