Similarity Estimations of Satellite Images of Region

S.Dhamodaran, B.Satya Bhushan, L.Vinay Vihar

Abstract: ***Weather forecasting has abundant impacts on the society and on our daily life from cultivation to disaster measures. Previous weather forecasting models used the complicated blend of mathematical instruments which was insufficient to get a higher classification rate. In this project, we propose new novel methods for predicting monthly rainfall using machine learning algorithms. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere. Machine learning algorithms can learn complex mappings from inputs to outputs, based solely on samples and require limited. Accurate prediction of weather conditions is a difficult task due to the dynamic nature of the atmosphere. To predict the future's weather condition, the variation in the conditions in past years must be utilized. The probability that it will match within the span of an adjacent fortnight of the previous year is very high. We have proposed the use of linear regressions and Random forest algorithm for weather forecasting system with parameters such as temperature, humidity, and wind. The proposed model tends to forecast weather based on the previous record, therefore, this prediction will prove to be much reliable. The performance of the model is more accurate when compared with traditional medical analysis as it uses a fused image having higher quality.***

Keywords: Classification, Forecasting, Image Processing, Random forest

I. INTRODUCTION

The growth of Artificial Intelligence has given birth to many new technologies out of which the popular ones are being Machine Learning Approaches and Deep Learning Techniques. Machine learning techniques are widely used in numerous applications such as medical image analysis [1], robot path planning [2], flood detection in a particular city or area [3] and land cover classification [4]. Machine learning technique is a process of learning a specific task without any human intervention and improving the performance only by the continuous learning process. The learning is of two types: supervised learning [5], where the labeling is given for the features of the training dataset and unsupervised learning [6], where no labels are given and the system needs to label the features of the dataset.

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S.Dhamodaran, Assistant Professor, Computer Science and Engingeering, Sathyabama Institute of Science and Technology, Chennai, India

B.Satya Bhushan, UG Student, Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, India

L.Vinay Vihar, UG Student, Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, India

Feature extraction is a vital process in all the machine learning approaches. The extracted features could then be used for various other approaches like classification or regression. Some of the classifiers used predominantly in machine learning techniques are SVM classifiers [7], Decision Trees [8], Naive Bayes [9] and Logistic Regression [10] and Random Forest Trees [11]. When larger datasets are being used in an application then the use of Artificial Neural Networks (ANNs) is preferred for feature extraction as it produces more accurate results [12]. Use of ANNs is widely called Deep Learning Approaches as the neural network learns each and every layer very deeply and uses the output of a layer as the input of the next layer. ANNs serves as a classifier resembling the function of a biological neuron having numerous layers connected to each other through weights [13]. In image processing, the number of pixels (picture elements) depends upon the input image. The image is the replica of reality which provides as much information as possible about an object. The arrangement of neurons forming layers and the connection patterns formed within and between each layer is called Network Structures. ANNs are information processing structures that can solve any problem through learned examples rather than pre-specified algorithms [14].

In this paper, we propose a model for predicting the weather beforehand to reduce various impacts on society and to make predictive measures for disaster reliefs. The Logistic regression and Random Forest algorithms are used to classify the images and predict the weather forecast. The rest of the section is as follows: Section II consists of Literature Survey, section III consists of the methodology used in the paper and section III consists of various results obtained. The paper is concluded in the last by mentioning the relevant future works that could be applied or added to the proposed work.

II. RELATED WORK

Numerous research works are proposed by various researchers using various machine learning techniques. A semi-automatic segmentation method proposed by Rui Lu et al. estimated the volume of tumor cells in liver [15]. The boundaries of the tumor cells were localized from a CT image. Though the process consumed quite a lot of time for computation it claimed to be very efficient in finding the volume of the tumor cells by segmenting it into slices. In [16], Kostas Haris introduced a hybrid image segmentation using a morphological algorithm for watersheds that combined edge and region-based techniques. The technique found to be effective as it reduced the number of false edge detection.

Emission of noise served to a part for indirectly increasing the processing time for the computation. Fanman Meng [17], designed an efficient and robust supervised image co-segmentation model comprising of a strategy called color reward and an active contour model. The model was evaluated on numerous images from a database and could efficiently pair the common objects with minimal error rate. Various research works have been carried out for weather forecasting too. Sharma et al. [18] have used machine learning techniques to predict solar generation from weather forecasts. In [19], the rain prediction was done using various classifiers to detect the amount of rainfall in a particular area.

III. PROPOSED APPROACH

The system proposed in the current research makes use of logistic regression and random forest trees to

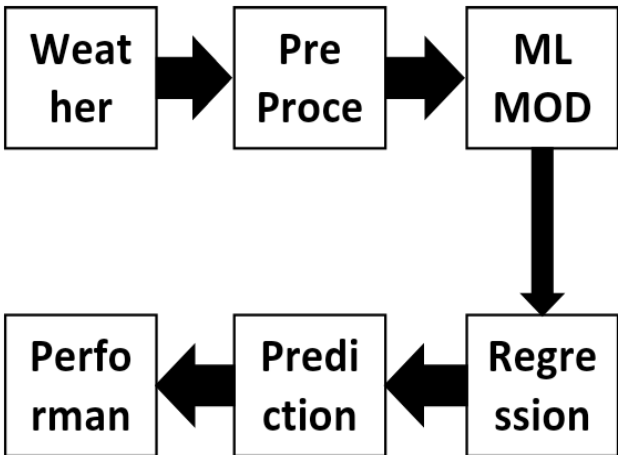


Fig. 1 Architectural Design of Proposed Model

automatically predict the weather though training using previous weather forecasts. Given a particular time or date the classifier is able to predict the weather of that given time using the trained data. A dataset is used to train the classifier that consists of various information about the previous weather conditions such as the amount of rainfall, the temperature of the day, the intensity of moisture and lots more Logistic regression technique is used for binary classification. here the classifier needs to classify based on only two conditions and does not give an output apart from the given labels.

The dataset issued to train the classifier. The random Forest Tree is used on multiple decision trees. The information stored in the parent node entire depends on the information stored in the child node. There are numerous child nodes present in the classifier and the root node is always one. The root node is responsible to determine the output of the classification which depends on the other nodes of the tree. Fig 1. shows the overall architecture of t he proposed model. The model comprises of the weather dataset that first enter the initial stage of pre-processing where it is converted into grayscale to get the intensity of the data obtained. Then the various approaches discussed like Random Forest Trees and Logistic Regression are performed to predict the weather.

IV. EXPERIMENTAL RESULTS

The experimental results were done on various datasets. The dataset consisted of various weather-related information of a particular city for a period of time. The experiment was performed in MAT Lab R2017b where a neural network was built to predict the weather of the city on a specific date.

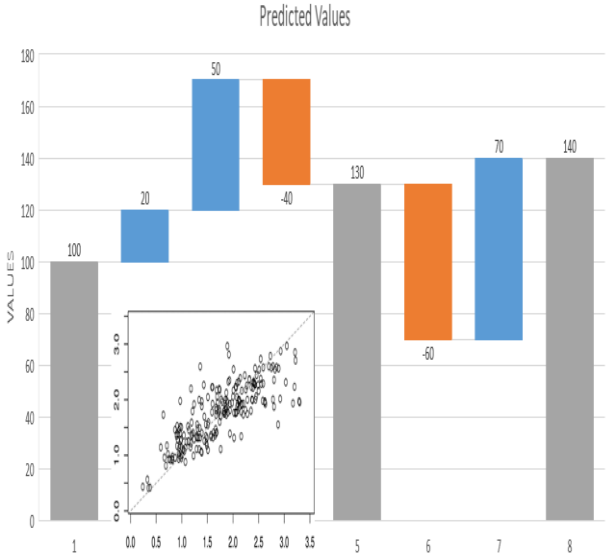
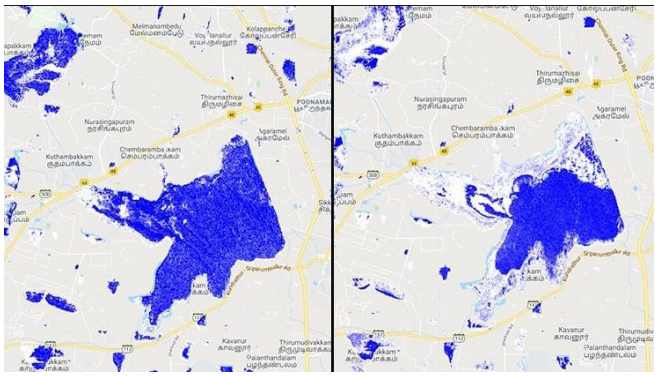


Fig. 2 Predicted values of the weather forecast

The network made use of Logistic regression and Random Forest trees to make the decision and prediction about the weather. The Computer Vision toolbox present in the MAT Lab was used to generate the network. Once the network was created using various layers, the dataset was loaded to perform the training. The training was given on the network where the features were extracted. Fig. 2 shows the experimental results that were obtained when classifier was trained on previous weather forecasts. Whereas, Fig. 3 depicts a sample weather prediction made by the classifier. The performance of the network was very accurate and the results are shown in the following figure. The network was able to efficiently detect the weather prediction for a specific given time.



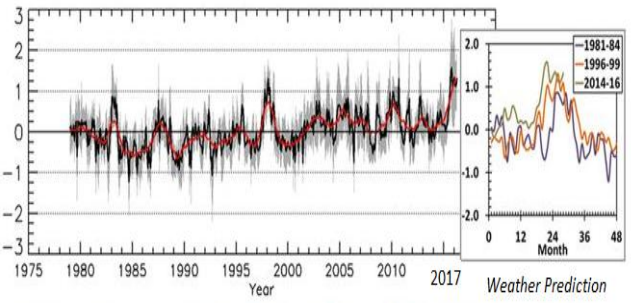


Fig. 3 Efficiency of the Proposed Model

V. CONCLUSION

Weather plays an important role in all aspects. It is better to predict the future weather and take if any necessary steps need to be taken to minimize the amount of life loss. In our proposed work, we have proposed a model that could predict or forecast the weather of any particular location where the classifier is trained with numerous previous weather information. The classification was performed using Neural Networks using Logistic Regression and Random Decision Trees as the algorithms. and the proposed model had good accuracy. The neural networks extracted the features of the dataset from the training set and were able to accurately predict the weather well in advance. Various other parameters such as efficiency and computational time for the process was also considered which was found to be better than the traditional methods. The future works may include the use of other deep learning techniques and also working on the security concerns of the neural networks.

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