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Weather Prediction System in Image using Xception-Net

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ABSTRACT----

Weather recognition is one problem encountered by most industries. For the case of self-driven cars, the car should be able to identify the weather in order to make appropriate decisions for driving. Weather recognition in modern agriculture is used in order to determine the existing condition of the weather. It can include image processing that is capable of identifying weather. As there are no special sensors applied to this technique, it would be more cost-effective. Now, it has become possible to build a dataset-based image classification solution. With the help of this transfer learning, this paper reports three proposed models with InceptionV3 and Xception-Net architectures toward weather recognition. Additionally, in this paper, an efficiency comparison of them is also being provided. The accuracy achieved by the model of Xception-Net is found to be 83.71%.

Keywords---Specifically Support Vector Machines (SVMs), Recurrent Neural Networks (RNNs), Unified Modelling language (UML), DUAL CORE 2 DUOS. .pkl file, Dataset, Importing the necessary libraries, Retrieving the images, Splitting the dataset, Building the model, Apply the model and plot the graphs for accuracy and loss, Accuracy on test set, Saving the Trained Model

I. Introduction

The weather forecast is a process of finding and predicting climatic conditions with a reasonable degree of accuracy by using multiple technologies. Many live systems require adjustment in their operations according to the weather conditions. Quantitative forecasts, like temperature, humidity, and rainfall, are important to the agricultural sector and traders dealing in commodity markets. In the present scenario, there are many methods that are used for weather forecasting. The three types of methods include mathematical modelling, statistical modelling, and artificial intelligence techniques. The numerical weather forecasting is considered as the mathematical model of the atmosphere which has been used for forecasting the future weather conditions with available data related to weather. The study includes huge knowledge of the atmospheric dynamics and comprises various sets of computation variables along with vast datasets. Another improvement was brought about by the modern hardware in computers. We are using ANN, which is based on smart analyzing the trend from historical data. The other models are accurate in calculation but not in predictions; the cannot able to adapt the irregular patterns of data which can neither be written in form of function nor deducted as formula. The weather forecasting reports require the use of intelligent computing that can understand nonlinear data and make rules and patterns out of the data collected to enable further prediction of weather conditions. More accurate results are expected by using ANN. In this case, error cannot be completely eradicated, but accuracy will be more improved compared to the previous forecast. These valid weather forecasting models available to this date are: The Weather Research and Forecasting model, General Forecasting Model, Seasonal Climate Forecasting model, and Global Data Forecasting Model. The computational demands by such prediction models are substantial and also computation-intensive. Contrariwise, data mining works in the context of time-independent databases in terms of either a probable and/or similarity patterns approach through. For all the categories of prediction, it will work the same and give a moderate accuracy [9]. The model's output can be needed for daily weather guidance or for weekly or monthly weather planning in weather forecasting. Thus, the accuracy of the results is highly vital for weather forecasting that aims at giving the best possible outcomes about various weather forecasting models.

II. Related Work Area

The Origins of Computer Weather Prediction and Climatic Modelling

Lynch (2008) explores the use of neural networks Support Vector Machines (SVMs) and Recurrent Neural Networks (RNNs), to tackle nonlinear regression estimation problems in weather forecasting. The author proposes a dependable prediction model for various applications by using SVMs. The paper also looks at how RNNs can spot patterns in real-time scenarios with the goal to reduce pattern mismatches.

A Rainfall Prediction Model Using Artificial Neural Network

With and others (2012) focused on finding sensitive information within code repositories. Their approach involves a two-step process: first identifying potential secrets using regular expressions. Then use machine learning models such as voting classifiers. To distinguish true secrets from false positives.

A Feature Based Neural Network Model for Weather Forecasting

Paras et al. (2009) presented a weather forecasting model that uses a feed-forward neural network with surface diffusion to predict weather parameters such as temperature and humidity. This makes it ideal to use features extracted from historical data to improve forecast accuracy. The proposed approach shows promising results and has the potential to be widely applied in weather forecasting.

Temperature Forecasting based on Neural Network Approach

Hayati and Mohebi (2007) studied the use of artificial neural networks for solar radiation prediction in Türkiye. They use various learning algorithms and transfer functions to train the network using geo-meteorological data. The results indicate a high accuracy in predicting solar radiation. This makes the model ideal for evaluating the potential of solar energy in areas with limited monitoring infrastructure...

A Weather Forecasting System Using Intelligent Multiagent-Based Fuzzy Neuro Network

Lee and Liu (2015) proposed iJADE, a multi-agent intelligent platform. To develop a weather forecasting system called iJADE WeatherMAN, the system uses intelligent agents that use fuzzy neural systems to collect, filter, and predict weather data. By integrating AI functions into an agent-based framework The system aims to improve the accuracy and efficiency of weather forecasts.

III. DATASET

In the first module, we developed a system to receive input datasets for training and testing. We bring together datasets for weather forecasting systems.

The 6862 weather images in the dataset include 11 categories such as dew, fog, snow, glaze, hail, lightning, rain, rainbow, snow cover, sandstorm, and snow.

IV METHODODLOGIES

Importing the necessary libraries:

We will use the Python language for this. First, we will import the necessary libraries such as keras to build the main model, sklearn to extract training and testing data, PIL to convert images into arrays of numbers. and other libraries like pandas, numpy, matplotlib and tensorflow.

Retrieving the images:

We extract their images and labels. Then change the size of the image to (299,299) so that all images are the same size for identification purposes. Then convert the image to many arrays.

Splitting the dataset:

The dataset is divided into train and test sets, 80% train data and 20% test data.

Building the model:

For building, we will use a sequential model from the keras library, then we will add layers to build the Xception network. Xception is a neural network with 71 levels of depth. You can download a pre-trained version of the network at Trained on more than [1] million images from the ImageNet database, the pre-trained network can classify images into 1,000 object categories, such as keyboards, mice, pencils, and various animals. Here we use for weather forecast from weather image dataset.

Apply the model and plot the graphs for accuracy and loss:

We will compile the model and deploy it using the fit function. The batch size will be 2. Then we will plot the graph for accuracy and loss. We achieved an average verification accuracy of 83.71% and an average training accuracy of 83.3%.

Accuracy on test set:

It has an accuracy of 83.3% in the test set.

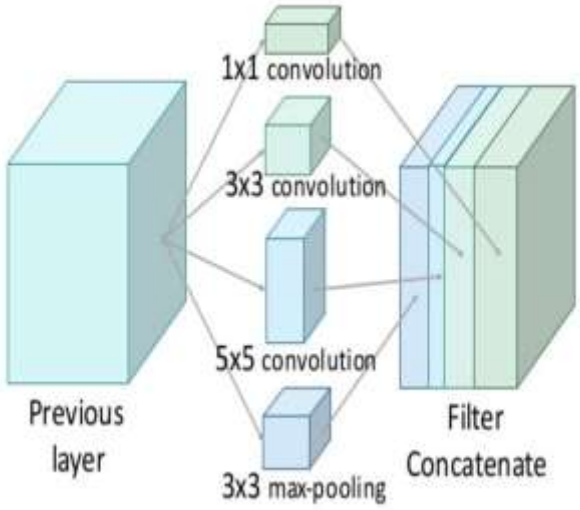
Saving the Trained Model:

When you're confident enough to take your trained and tested model into a production-ready environment, The first step is to save it to an .h5 or .pkl file using a library such as Pickle...

Make sure you have pickles in your environment.

Next, let's import the module and transfer the data to the model PKL file.

SYSTEM ARCHITECTURE



V RESULT

Xception-Net, a powerful deep learning architecture Use image data to find weather forecasts This method takes advantage of the network's ability to extract complex patterns from image data. which could revolutionize weather forecasting By training Xception-Net on a large dataset of weather images. The model learns to identify subtle visual signals related to different weather conditions. These signs can include cloud formation. weather pattern and other visual indicators Once practiced The model will be able to analyze new images. To predict the most likely weather outcomes, such as sunny, rainy, cloudy or stormy. This visual weather forecast system has several advantages: first, it avoids the need for traditional meteorological data; and make it accessible in regions with limited data infrastructure. Second, it may provide more accurate and timely forecasts. Especially in rapidly changing weather conditions. Still under development This Xception-Net based method holds promise for improving weather prediction capabilities. and improve our understanding of atmospheric phenomena.

VI Conclusion

For multi-object detection and recognition in intelligent roadside inspection systems. We present an efficient flowchart for night image enhancement using multi-source level data fusion. Smart roadside systems are appropriated through various forms of enforcement. that involves combining multiple sensors using a fixed view and Simple integration of multiple sensors The two most important integrations are the decision layer between camera and radar data. and the pixel layer between daytime images and nighttime images

VII. Future Scope

The big challenge in accurate outcome forecasting is that it is used in many real-time systems such as power departments, airports, tourist centers, etc. The difficulty of this forecasting lies in the complexity of the parameters. Each parameter has a different set of values in the range. This problem is solved by ANN accepting all complex parameters as input. and create intelligent models during training and use the same model to create predictions...

VIII. REFERENCES

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