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Monthly Rainfall Forecasting using 1-D Deep Convolutional Neural Network

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Abstract - *Rainfall prediction is one of the challenging tasks in weather forecasting. Accurate and timely rainfall prediction can be very helpful to take effective security measures in advance regarding: on-going construction projects, transportation activities, agricultural tasks, flight operations and flood situation, etc. Data mining techniques can effectively predict the rainfall by extracting the hidden patterns among available features of past weather data. This research contributes by providing a critical analysis and review of latest data mining techniques, used for rainfall prediction. In our proposed system we propose a new forecasting method that uses a deep convolutional neural network to predict monthly rainfall for a selected location. To our knowledge, this is the first time applying a deep CNN in predicting monthly rainfall. The convolutional layer is the main building block of the convolutional neural network. Usually, the layers of the network are fully connected in which a neuron in the next layer is connected to all the neurons in the previous layer. In our proposed system we are going to predict the rainfall result based on the accuracy which we get in train and test of the dataset based CNN algorithm using that we show the graph result*

1. INTRODUCTION

The increasing availability of climate data during the last decades (observational records, radar and satellite maps, observations from ship and aircraft, proxy data, etc.) makes it important to find an effective and accurate tools to analyse and extract hidden knowledge from this huge data. Meteorological data mining is a form of Data mining concerned with finding hidden patterns inside largely available meteorological data, so that the information retrieved can be transformed into usable knowledge. Useful knowledge can play important role in understanding the climate variability and climate prediction. In turn, this understanding can be used to support many important sectors that are affected by climate like agriculture, vegetation, water resources and tourism.

2. PROJECT DESCRIPTION

EXISTING SYSTEM

The Existing system doesn't classify the data accurately. It decreases the accuracy of the data classification and prediction. For increasing the accuracy of the data classification and prediction the proposed system is introduced. Classification using large volume of data decreases the accuracy of the classification.

DISADVANTAGES

- Theoretical Limits.
- Loss of Information and incorrect classification results.

PROPOSED SYSTEM

The proposed model is introduced to overcome all the disadvantages that arises in the existing system. In our proposed system we are going to use CNN algorithm for the prediction of rainfall. Also, we evaluate the performance result of algorithm based on mean absolute error, mean squared error and root mean squared error. It enhances the performance of the overall classification results.

ADVANTAGES

- High performance.
- Provide accurate prediction results.
- Reduces the information Loss and the bias of the inference due to the multiple estimates.

3. MODULES AND DIAGRAMS

Modules applied in rainfall forecasting for providing an efficient result are

- Data Selection and Loading
- Data Preprocessing
- Splitting Dataset into Train and Test Data
- Feature Extraction
- Classification
- Prediction
- Result Generation

DATA SELECTION AND LOADING

The data selection is the process of selecting the data predicting the rainfall. In this project, the rainfall dataset is used for predicting rainfall. The dataset which contains the information about the monthly wise data of rainfall with corresponding location.

DATA PREPROCESSING

Data pre-processing is the process of removing the unwanted data from the dataset.

- Missing data removal
- Encoding Categorical data

Missing data removal: In this process, the null values such as missing values are removed using imputer library.

Encoding Categorical data: That categorical data is defined as variables with a finite set of label values. That most machine learning algorithms require numerical input and output variables. That an integer and one hot encoding is used to convert categorical data to integer data.

SPLITTING DATASET INTO TRAIN AND TEST DATA

Data splitting is the act of partitioning available data into. Two portions, usually for cross-validators purposes. One portion of the data is used to develop a predictive model and the other to evaluate the model's performance. Separating data into training and testing sets is an important part of evaluating data mining models. Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing.

FEATURE EXTRACTION

Feature scaling is a method used to standardize the range of independent variables or features of data. In data processing, it is also known as data normalization and is generally performed during the data pre-processing step. It is a step of Data Pre Processing which is applied to independent variables or features of data. It basically helps to normalise the data within a particular range. Sometimes, it also helps in speeding up the calculations in an algorithm.

CLASSIFICATION

Classification is a process related to categorization, the process in which ideas and objects are recognized, differentiated, and understood. In this project, the CNN algorithm is used for classifying the data. The convolutional layer is the main building block of the convolutional neural network. Usually, the layers of the network are fully connected in which a neuron in the next layer is connected to all the neurons in the previous layer.

PREDICTION

It's a process of predicting rainfall from the dataset. This project will effectively predict the data from dataset by enhancing the performance of the overall prediction results.

RESULT GENERATION

The Final Result will get generated based on the overall classification and prediction. The performance of this proposed approach is evaluated using some measures like,

- Accuracy
- Graph based on prediction

ARCHITECTURAL VIEW

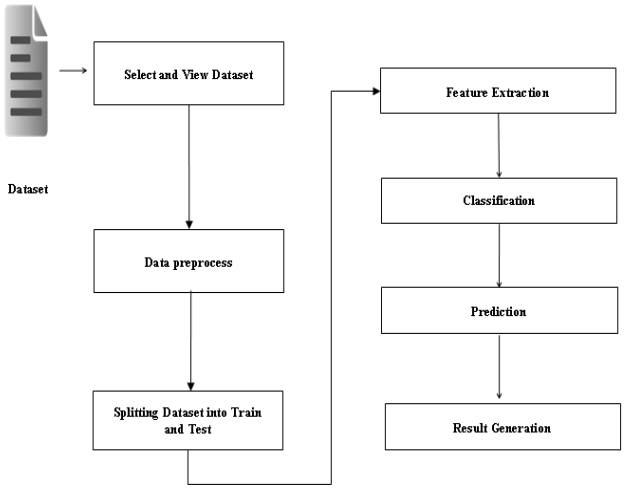

Fig 1. Architectural View

Data retrieved from data set are passed through view dataset and sent to data pre-processor which falls under two process as

- Missing data removal
- Encoding Categorical data

The data's from the pre-processor are tested by train and test method and sent to feature extraction, those extracted data are classified and predicted to provide an effective output.

3. EXPERIMENTAL RESULT

```
Epoch 1/1
25000/25000 [==============================] - 239s 10ms/step - loss: 0.4341 - acc: 0.7875
Accuracy: 85.86%
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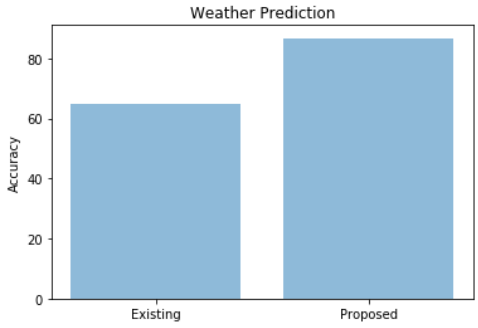

Fig 2. Final Result

4. CONCLUSION

This project Evaluate the performance of the classification and prediction. It finds the different classification performance and its summary effectively and quickly. It alleviate the sparsity problem and reduces the information loss. The accuracy of the classification result is highly increased.

FUTURE WORK

In future, we will implement this process in different platforms. Data mining is one of the most widely used methods to extract data from different sources and organize them for better usage. In spite of having different commercial systems for data mining, a lot of challenges come up when they are actually implemented. With rapid evolution in the field of data mining, companies are expected to stay abreast with all the new developments.

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