

PREDICTION OF VEGETABLE COST BASED ON WEATHER CONDITION USING FIXATE RECURRENT NEURAL NETWORKS (FRNN)

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Abstract - In our day to day life every people work hard for Food and Shelter. Food needs many ingredients like Cereals, Pulses, Vegetables, Fruits and Millet. But people suffer a lot when there is an extreme increase in rate of those ingredients. Not only the public but also the farmers are facing the same problem when there is a decrease in the rate. Prediction of rate of the vegetable is difficult because, the yield may reduce or increase at any time. The metabolism of the crop determines by monsoon. To handle the situation there should be an application for prediction of the rate of vegetables. In this paper, the proposed system is designed to explain the idea of creating an application which predicts the rate of Vegetables. After prediction of the rate the notification is sent via Mail to the higher authority. This gave a precautionary idea to handle the reduce in vegetable rate by the Government. We have used FRNN algorithm for predicting the Weather.

Key Words: Crop Yield, FRNN, Monsoon, Rate of Vegetables, Weather.

1. INTRODUCTION

A seasonal change is one of the main factors to decide the increase and decrease in the yield of the crop. They affect the economy of both people and country. For solving this problem the idea of creating an application to predict the rate of the vegetables by the weather report using machine learning was helpful. In these days, seasonal changes are more common problem because of Global Warming, this causes damage to the growth of plants. This change of season affects the plants in their metabolism, so that they do not give enough harvest of vegetables to people as expected. Because of this, the rate of vegetables reach heights so that it may affect the people's normal life. At the same time in some cases when the vegetables rate decreases it affects the farmer. To solve this, the weather report would help to predict the rate of the vegetable, how long it may exist and how much they can extend their price. This may advise a precaution for the Government and suggest to take further activities. [1][2]

2. Predictions

2.1 Weather Prediction:

Weather forecasting is the application of science and technology to predict the conditions of the atmosphere for a given location and time. People have attempted to predict the weather informally for millennia and formally since the 19th century. Weather forecasts are made by collecting quantitative data about the present state of the atmosphere at a given place and using meteorology to project how the atmosphere will change.

There are many techniques to predict the Weather and they are:

- a) Persistence.
- b) Use of Barometer.
- c) Looking at Sky.
- d) Analog Technique.
- e) Forecasting Model.

In proposed system, FRNN i.e., Fixate Recurrent Neural Networks is used for predicting the weather. FRNNs are strong and robust sort of neural network, and belong to the foremost promising algorithms in use because it's the sole one with an indoor memory.

Like many other deep learning algorithms, recurrent neural networks are relatively old. They were initially created within the 1980's, but only in recent years have we seen their true potential. An increase in computational power along with the massive amounts of data that we have to work with, and the invention of Long Short Term Memory (LSTM) in the 1990s, has really brought RNNs to the foreground. We made slight changes in recurrent neural network and named that as FIXATE RNN. In FRNN, we predict weather for one day based on 7 days historical data of temperature. This is used to determine the cost of the vegetable on that day. [3][4]

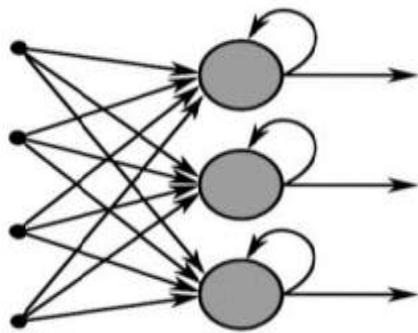


Fig. no . 1.1

Because of their internal memory, FRNN can remember important things about the input they received, which allows them to be very precise in predicting what's coming next. This is why they're the well-liked algorithm for sequential data like statistic, speech, text, financial data, audio, video, weather and far more. Fixate Recurrent neural networks can form a much deeper understanding of a sequence and its context compared to other algorithms. [5]

FRNN has two inputs, the present and the recent past. This is important because the sequence of knowledge contains crucial information about what's coming next, which is why a FRNN can do things which other algorithms can't. Long STM networks are an extension for recurrent neural networks, which basically extends the memory.

Therefore it's compatible to find out from important experiences that have very long lags in between. The units of an LSTM are used as building units for the layers of a RNN, often called an LSTM network. LSTMs enable RNNs to remember inputs over a long period of time. This is because LSTMs contain information in a memory, much like the memory of a computer. The LSTM can read, write and delete information from its memory. Likewise the FRNN also works.

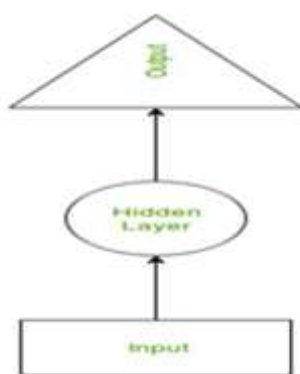


Fig. no . 1.2

This memory can be seen as a gated cell, with gated meaning the cell decides whether or not to store or delete information, based on the importance it assigns to the information. The assigning of importance happens through weights, which also are learned by the algorithm. In an LSTM you've got three gates: input, forget and output gate. These gates determine whether or not to let new input in (input gate), delete the information because it isn't important (forget gate), or let it impact the output at the current time step (output gate) [6]

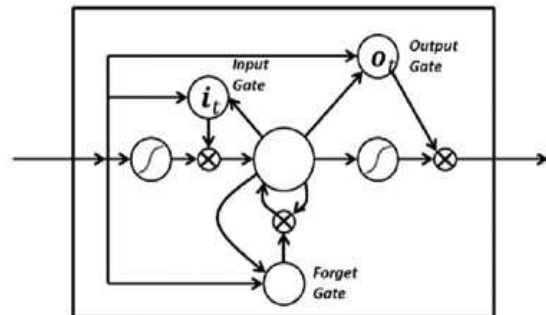


Fig. no. 1.3

Input Gate:

$$i_t = \sigma (W_i \cdot [h_{t-1}, x_t] + b_i)$$

Output Gate:

$$o_t = \sigma (W_o \cdot [h_{t-1}, x_t] + b_o)$$

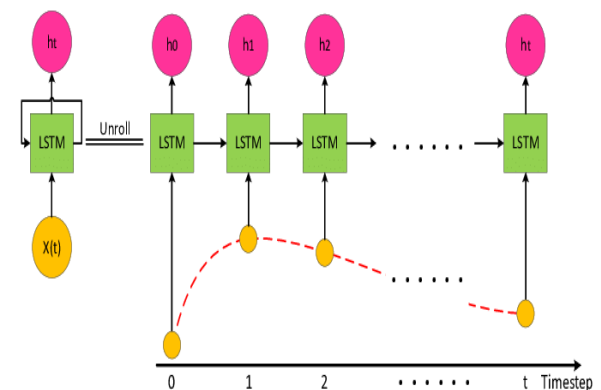


Fig. no. 1.4

FRNN is a deep learning model that's used for Time-series prediction etc. FRNN is employed once we want to predict a future outcome supported the previous inputs. [7].

FRNN model which provides one day forecast of temperature supported 7 days of historical temperature data. [8][9]

Dataset of Weather:

Index	Temperature	Wind Speed
0	68.9	6.9
1	66.4	5.8
2	68.7	9.2
3	71.4	9.2
4	69.3	9.2
5	68.5	9.2
6	66.5	6.9
7	67.2	4.7
8	68.7	3.4
9	68.9	6.9
10	65.7	4.7
11	65.6	6.9
12	67.1	9.2
13	66.8	9.2

Table no. 1.1

The reference of dataset is made by the kaggle website for creating the dataset for vegetable and weather. By using FRNN algorithm, they are predict one day temperature based on 7 days historical data. The prediction of the weather report for one day based on past seven days using FRNN algorithm.

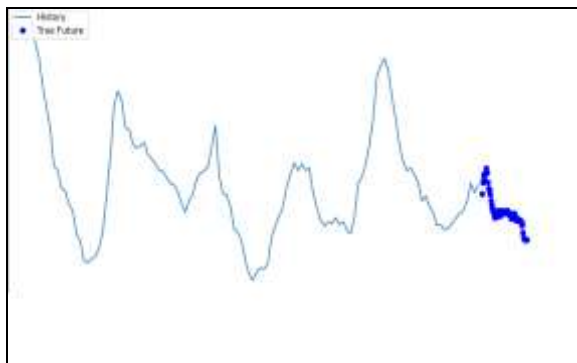


Fig. no. 1.5

2.2 Vegetable Rate Prediction:

The rate of the vegetable was predicted by the weather dataset. The weather data set would having the past weather data in which they are fed to the API which will combine to predict cost of the vegetable. The vegetable rates would present in the dataset in which they have the past details of the vegetable rate at different situations.

The Prediction rate of vegetables is based on comparing actual rate, past rate and also current source of the vegetables. This comparison is represented as following graph, [9]

Target and Prediction Rate:

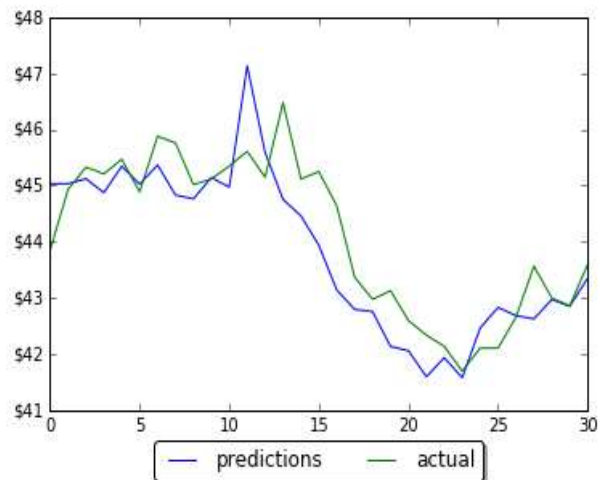


Fig. no. 1.6

By using this FRNN Algorithm by prediction of weather, we can only predict the rate but we can't fix the rate. It may increase and decrease the rate from the predicted rate. [11][12][16]

Example: Rating of Vegetable:

Date	Price
10-Aug-2017	64.16
9-Aug-2017	63.86
8-Aug-2017	63.69
7-Aug-2017	63.67

Table no. 1.2

The rate prediction is already implemented in the USD to INR conversion. It gives result for next 7 days. The dataset which has the past rate details of the vegetables was stored in the database of the calculation of the future rate prediction of the vegetable.

Example Dataset of Vegetable Detail:

```
{
  "vegetableName": "onion",
  "soilTypes": [
    "slightlyDamp",
    "sandyLoam",
    "clayLoam"
  ]
}
```

```
],  
"varieties": [  
    "smallCommonOnion",  
    "redOnion"  
]  
},
```

Example Dataset of Vegetable rate in year-wise:

```
{  
    "vegetableName": "onion",  
    "year": "2016",  
    "rate": "75"  
},  
{  
    "vegetableName": "onion", "year": "2017",  
    "rate": "35"  
},  
{  
    "vegetableName": "onion",  
    "year": "2018",  
    "rate": "50"  
},  
{  
    "vegetableName": "onion",  
    "year": "2019",  
    "rate": "150"  
}
```

3. Literature Survey

Perfect weather predictions are needed for daily activities and it had been one among the most challenging problem facing throughout the planet because it consists of multidimensional and nonlinear data. As per the survey the various methods and algorithms used for weather prediction we are chosen the FRNN algorithm for the application. And the FRNN is derived based on the RNN algorithm. [13][14][15]

- a) M.Viswambari, Dr.R.AnbuSelvi etal, Back propagation technique Rainfall, wind pressure, humidity Monthly Forecast.
- b) Nikhil, Sethi, Dr.KanwalGarg etal, Multiple rectilinear regression technique Rainfall, vapor pressure, average temperature cloudiness 30 years.
- c) Pinkysaikiadutta, hiteshtahbilder 2014. etal, data processing techniques Temperature, pressure, wind direction, rainfall, humidity 6 years period.
- d) Sanjay D.Sawaitul, et al 2012. Etal, Back Propagation algorithm Rainfall, temperature, humidity, prediction 24 hours.
- e) ManishaKharola, Dinesh Kumar 2013. Etal, Back propagation algorithm Temperature, Humidity, Pressure For vegetable the survey is taken from many farmers about the vegetable's condition in which they grow, including soils in which they grow, under what climatic conditions.
- f) The survey is also made directly interrogating with the farmers under some of the fields,

- a) Vegetable Name
- b) Soils
- c) Climatic Condition
- d) Fertilizers

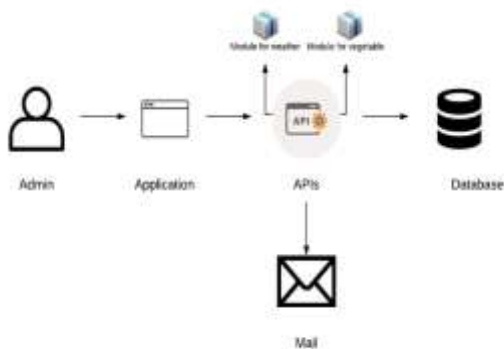
These are the fields in which the survey is made. [17][18][19]

4. Working

The application will be having a Login page and Dashboard. In which only admin will able to login to get the details of the vegetable rates.

Then it will have the normal information of the weather report also. After prediction of the rate then there will be a notification via Mail to the authority which intimates the rate of the vegetable and harvest of that particular vegetable. The weather prediction is made by python. With the information, precautionary actions can be taken to control the extreme level of pricing of vegetable.

Work Flow:



5. Conclusion

The main concept of the proposed application is to predict the vegetable rate. By this application we can able to control the increase and decrease in the rate of vegetables. This will be helpful for people, farmer and Government to take precautionary act for controlling the rate of vegetable. It also generates report of the cost predicted by the calculations made by the application, and send notifications.

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