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Machine Learning Approach to Predict Farmer's Loan/Credit Repayability using Weather Prediction and Credit History

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Abstract: The premise of our paper is with the help of Machine Learning, we aim to develop a comprehensive rating system using the predicted outcome of weather prediction and an individual's credit history. With our system, an individual could find out the likelihood of the ability of fulfilling the loan undertaken, similarly financial institutions can use the system to find out the likelihood of the credit being repaid and the individual's eligibility of the maximum credit. The demand of agriculture sector has increased due to large population in India. It has become essential to consider effective technologies in agriculture. Through our portal, the idea is to develop an algorithm via machine learning would give a rating on a scale (0-10), which would determine the eligibility of the farmer being able to fulfill the loan. Through our portal, we will try to inform farmer and banker what all changes in weather are taken place and climate of all the region. Our portal uses the past forecasted raw data of few year to predict the recent forecast.
Keywords: Machine learning, Weather forecasting, Weather Prediction, Farming, Agricultural Sector, Loans, Suicides, Farmer Debt, Algorithms.

I. INTRODUCTION

The aim of our project is to develop a farmer portal website which will indicate the eligibility criteria in terms of a scale where output will be given based on machine learning algorithm by combining the previous credit history of farmers and the optimal forecasted weather conditions with the help of machine learning. It will be helpful for providing maximum loan to farmers for maximum harvests and maximum profits. With the increasing annual temperatures rising due to climate change and various other factors, farming is becoming increasingly more and more risky. Taking the blunt of the failing harvests are the farmers which have not only to deal with the financial instability of selling their failed harvests, but also various loans taken by micro lenders and banks alike. Due to this farmers from various regions in India such as Maharashtra, Karnataka, Madhya Pradesh, Kerala, Tamil Nadu, Gujarat etc. now have had largest number of farmer suicides. Bankruptcy is infact one of the leading causes of suicides in the country, so much so that in fact National Bank for Agriculture and Rural Development (NABARD) in 2015 stated that defaulted loans for health-related issues increased three times in 2014. In 2015, nearly 80% of farmers belonging to the low-income category committed suicide various reasons such as bankruptcy and/or debts after taking loans from banks and registered microfinance institutions as proven by official government reports and data. According to NCRB, this is a first time that categorization of suicides cases of agricultural employees due to debt or bankruptcy is required.

II. IMPLEMENTATION

We have developed a thoroughly comprehensive and easy to understand website with the combination of html, CSS, PHP and JavaScript to demonstrate the most user friendly and efficient user experience. The back end of our machine learning operations is developed on R programming. R language is the most east and robust machine learning and data management platforms. We have created two databases, one consisting and predicting the current and future weather conditions using variety of parameters like rainfall, average sunshine, maximum and minimum temperature, etc. of states and whether it is satisfactory and that would influence our decision. And the other database would contain all the personal profile information that the user would consent to provide to us, which would include his UIDAI information, financial information, location and whether if the candidate has a good financial score. Using all this information, we have developed set of algorithms where both the decisions of the tables and various deciding factors induce a numeric value. This numeric value would be represented on a scale. If the results on the scale are high enough or on the higher side would denote that both the weather conditions for the next year and the farmers credit history are in good standing and

this individual is eligible for the investment. During this phase the bankers get an additional information regarding the maximum investment to be made to get maximum profit. If the score is on the lower side, either due to low credit history or bad predicted weather for a crop, alternative options would be provided either to improve credit scores or some other alternative crops which would survive that harsh unpredicted weather. If the decision to switch to alternative crop is made, then new scores would be displayed upon which the maximum eligibility for the loan would be displayed. Alternatively, other options such as crop insurances, ways to maximize harvest, crop health, offers and discounts on various farming equipment's and governmental agricultural sector related news and subsidies etc. It will also keep track of crops, soil tested for region and market analysis. The system also suggests which crop to cultivate according to the favorable climate.

III. ALGORITHMS

Since this program is done on R programming, there are 2 main sections of output in shiny module, server and UI. other data frames and parameters include data on maximum rainfall, minimum & maximum temperatures, soil condition etc.

```
library(readr)
library(ggplot2)
library(forecast)
library(dplyr)

Forecast.city  <- forecast(city <- ts(city, start = c(1), end = c(10), frequency = 1), 1)$mean
Forecast.city  <- rbind(city, forecast.city)
forecasted.city <- rbind(forecast.raigad, ifelse(forecast.raigad[nrow(forecast.ciy),] > 'average of parameters', "yes"
, "no"))
Forecast  <- cbind(forecast, forecasted.city)

for(i in 1:nrow(finance)){
  Financial scores[i:nrow(finance)] <- rowMeans(finance[i,2:5])
}

for(i in 1:nrow(finance)){
  Decision of outcome[i:nrow(finance)] <- ifelse(finance$Mean[i:nrow(finance)] > 'desired set score', "yes" , "no")
}

for(i in nrow(finance)){
  ifelse(Name of person[i]==colnames(forecast[1,i]),    ifelse(finance$Decision[i,8]==rownames(forecast[1,i]),
         Name of person,
         Location of person),
     Decision of person)}
```
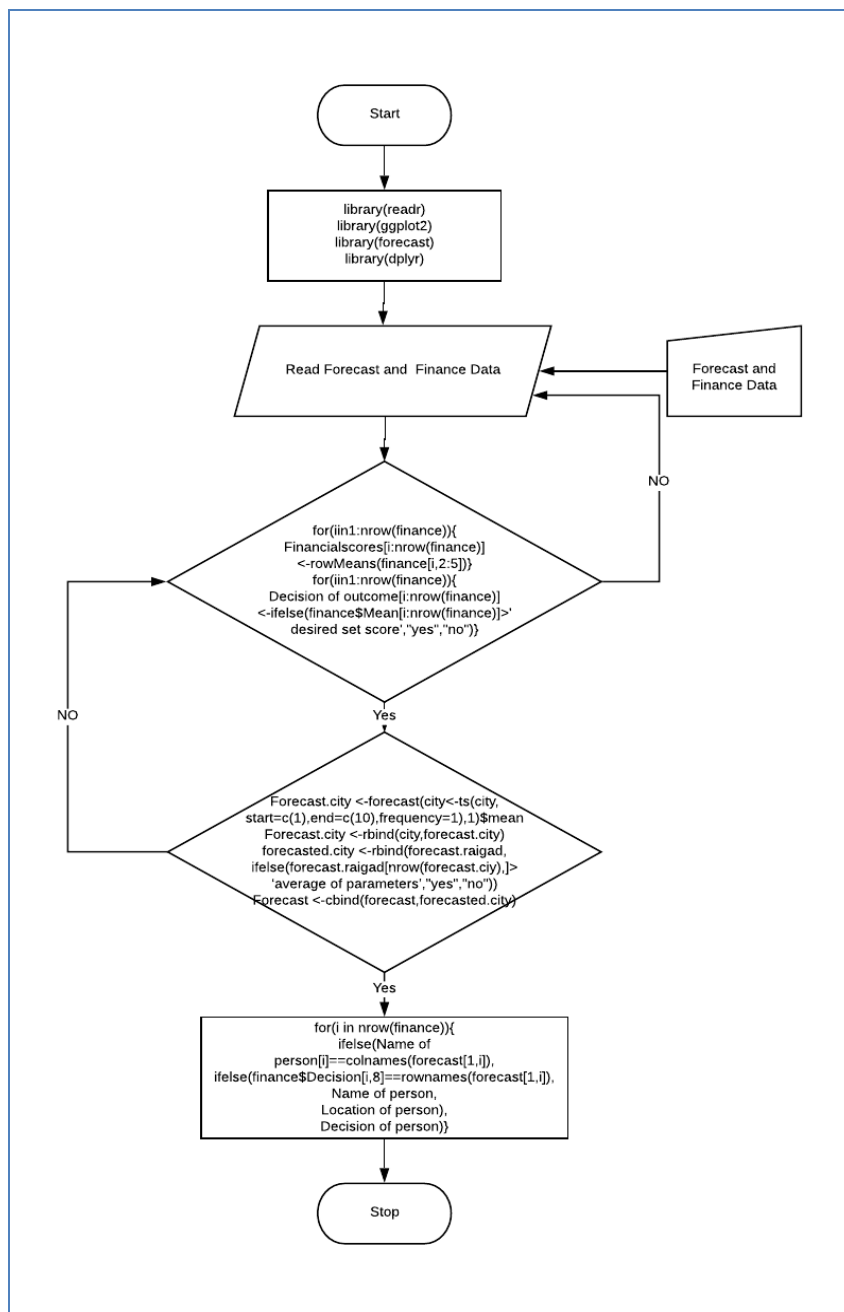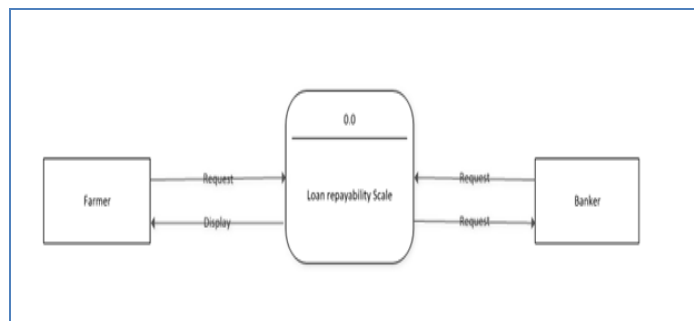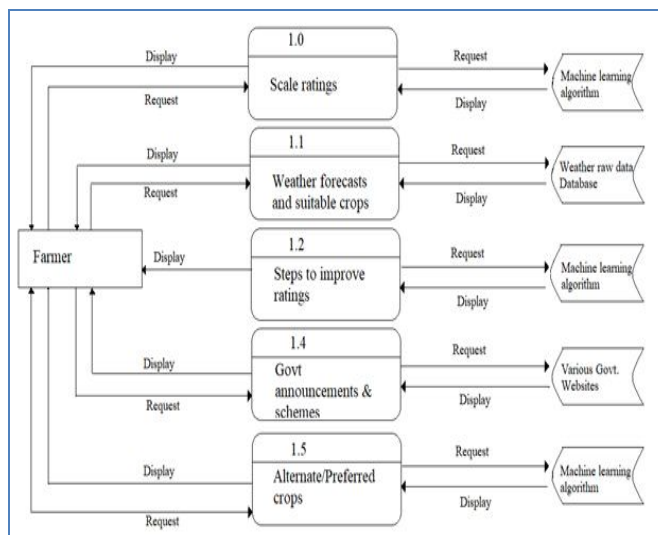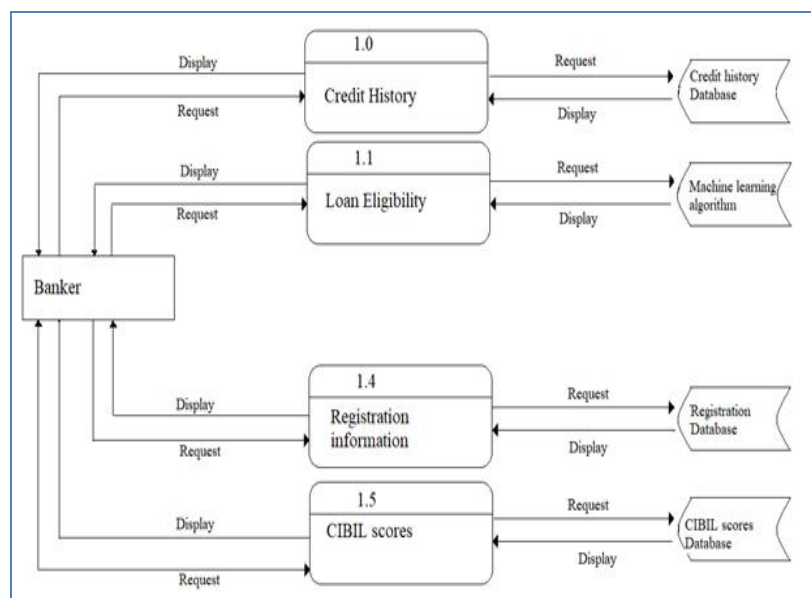
Figure: - Flowchart of the algorithm

Level 0 Data Flow diagram

Level 1.1 Data Flow diagram
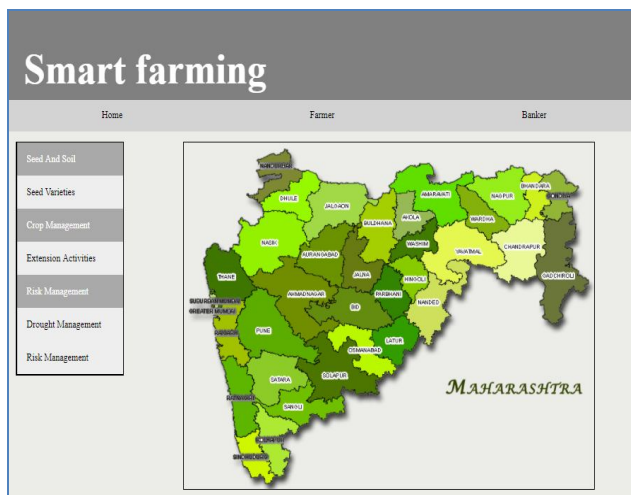

Level 1.2 Data Flow diagram

IV. SIMULATION AND OUTCOMES

The evaluation of the propounded algorithm is done in R programming software R studio using both real and simulation data. The parameters used for simulated data frames are minimum and maximum temperature, maximum rainfall, average sunshine etc. With the help of an R package called Shiny, which makes it easy to build interactive web pages straight from R, the output is displayed starting with the name and information of the individual, the eligibility decision based on calculations, a numeric value of the criteria and various other statistical chart to help understand the output. Also, additional links and references are provided to improve the scores

V. CLOSURE AND FUTURE WORK

In this project, A machine learning approach to predict farmer's loan/credit repayability using weather prediction and credit history has been implemented. A website has been created with the help of CSS and Studio in addition to help facilitate the project further. There is future scope in improving the accuracy improving the efficiency of the algorithm and providing more data parameters. Also, the website can be improved further to implement new ideas and schemes.

VI. SCREENSHOTS

VII. CONCLUSION

Through balanced understanding within the team members we have been successful in designing planning and documenting the application and website called "Machine learning approach to predict farmer's loan/credit repayability using weather prediction and credit history".

We have acutely studied, analyzed and planned the features and function of the system. As we are focusing on helping the bank for repayability of loan and farmer for applying for the loan in the bank. The application is designed using multimedia which will help the farmer to operate it properly. As we are focusing on making the website and the application. The main concept of while developing the application was the usefulness of the application towards farmer by implementing the multimedia. The website is being developed so that it will help the Bank to grant the loan to the farmer based on its previous record and the irrigation of the crop within the region based on the climate. So, our main motive is to make ease in the process of applying for loan and repayability of the loan by the farmers by developing the application and the website.

VIII. ACKNOWLEDGEMENTS

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