

Plant Recommendation System with the Use of Weather Forecasting

Maulik Dhamecha¹

¹Department of Computer Engineering, VVP Engineering College, Rajkot, Gujarat, India

Abstract

Planting is enjoyed by many people, but somehow their plants do not grow properly, one of the reasons for the poor growth of their own plants is the favorable weather conditions for the plants. Climate factors affect the growth rate of plants. The effect of weather on plants varies between plant species during their lifetime. For each species, there is a defined range of maximum, maximum and minimum temperatures for their growth. It is therefore important to know which plant is suitable for growth in these climatic conditions. The weather changes as the user's location changes. In this article, an architecture is proposed that recommends plants based on the monthly weather of the user's location. In addition, different climatic effects such as the effect of temperature, the effect of humidity, the effect of rainfall on different plants are discussed.

Keywords

Climate, temperature, humidity

1. Introduction

Plants are more responsive to climate fluctuations than animals. They are also unable to find hot or cold places. As the temperature rises, the plants grow taller to cool. The stems of plants are longer and their leaves shrink and grow further, which reduces the nutritional value of plants and their function. In addition, extreme temperatures, declining water availability, and changes in soil conditions actually make plant growth more difficult. Climate change is expected to limit plant growth. Climate change affects the various changes that determine the amount of plants that can grow. According to the study, which relies on analysis of satellite data and weather forecasts, a 7% drop in the average number of cold days will actually contribute to plant growth. The tropics can lose up to 200 days per year.

Climate change can affect agriculture through the effects of crops, weeds, soil, pests and diseases. In crops, the major climate changes that are involved are temperature, sunlight, precipitation and atmospheric CO₂ concentration. In this article, we propose an architecture that tells the user which plant is suitable for growing in a user-defined area. In nature, there is an interaction between climate factors and they all affect each other. In a controlled environment, ie in a nursery, temperature is the most influential factor in this interaction. In extreme temperatures and humidity, or when it is too dry or humid or too hot or too cold, growth stops, which can kill plants if conditions persist. Therefore, environmental conditions play an important role in the growth potential of plants and in the general health of plants.

Plant growth is declining day by day and it has been observed that the main cause of most plants is the influence of climate factors on them. Thus, it is important to plant in an area where the environment is conducive to them. Our architecture determines the optimal temperature and plants of

International Conference on Emerging Technologies: AI, IoT, and CPS for Science & Technology Applications, September 06–07, 2021, NITTTT Chandigarh, India

EMAIL: mvdhamecha@mail.com (A. 1)



©2021 Copyright for this paper by its authors.
Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).
CEUR Workshop Proceedings (CEUR-WS.org)

a particular area by mining data. We use GPS to find the geographical coordinates of the user's location in the form of verticals and latitudes.

We use the Weather Forecast API to find the client parameters for that particular location provided by the user. From this setting and using the database, our model will recommend plants for that particular location. The main purpose behind creating this model is to encourage people who really want to plant so that they do not get frustrated if their plant does not give much effect and growth even after planting a lot. " Information and especially because this type of situation is an unfavorable climate for their plants. So this model will help these people to plant their plants.

2. Method and Architecture

In our model, we use the Weather Forecast API from Openweathermap.org. There are other weather forecasting APIs, but the main disadvantage of all these APIs is that they cannot predict the current month's weather. In addition, some APIs cannot predict the weather in all cities. When user will turn on his location, from GPS system model will get the current location of the user. Extracted location from GPS system will be given to weather forecast API.

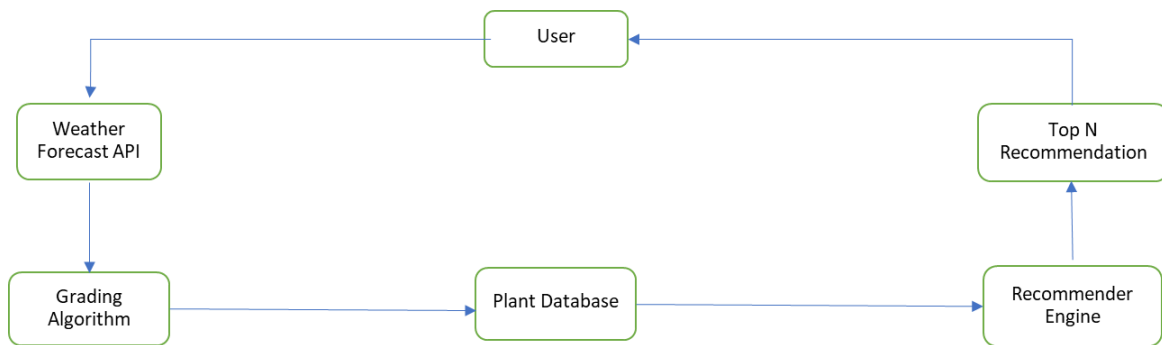


Figure 1: Basic flow of system

The open weather map compares all the historical measurements of the current month with the climate measurements for the month. So by using web scrapping in python we will give input in lat and lon variable as latitude and longitude geographic coordinates of user location and based on that we can fetch the monthly information using result set in that average temperature using variable temp:mean, average humidity using variable humidity:mean , average precipitation using precipitaion:mean. Depends on the climatic condition, we are considering three parameters which are important factor for the growth of plant.

- Humidity is the amount of water vapor in the air at a given temperature, and is expressed as a percentage. Moisture levels are important to allow the plant to continue its metabolic processes at the required rates. Seeds germinate faster at higher humidity levels, as in the case of cuttings.
- If heat and light, which cause the temperature to rise, are not properly controlled, plants can suffer heat loss. Heat is used to increase humidity in rooms, by wetting trays, and to wet the floor.
- Rainfall can determine how fast a crop grows from seed, including soil health. Some plants need a good amount of rain, while others do not.

3. Experiment

Now using the ranking algorithm, we are going to categorize each feature which is temperature, humidity and precipitation and give ratings based on its value. Rating will be given in 5 categories

which are Extreme, High, Medium, Low and Very Low. For example, if the temperature is around 20 degrees Celsius, this is considered a moderate range.

Table 1
Grading of temperature and humidity

Parameter	Temperature range (in kelvin)	Humidity (in percentage)
Extreme	313 +	70+
High	298 – 313	55-70
Moderate	285 – 298	45-55
Low	263-285	30-45
Very low	Less than 263	Less than 30

Categorized data available from grading algorithm is used for data mining of plants database. Recommender system is used for extracting the plants which is suitable to grow at categories climate measurement (Temperature, Humidity and Precipitation).

There are three types of recommendation systems: content-based recommendation, collaboration-based recommendation, and hybrid recommendation. In our architecture, a content-based referral system is used. If additional information is available, the recommended template content-based method is used. And we have climatic measurements classified as user's current location and additional information. Two other support-based recommendation methods are used if similarities are identified between users based on their ratings and hybrid recommendation is a combination of two other recommendation systems. Grouping is done for future analysis. The recommender will then make the best recommendations for the plant that will suit the user's weather and if the user wants, they can filter to their liking.

4. Result Analysis

For result we are considering the specific location that is Ahmedabad. From GPS, the geographic coordinates for the location are stored in the variable latitude and longitude. And by using statistics API in openweathermap and using web scraping we gave lat in lon as input variable in the query string of the link and extract the temp:mean, humidity:mean and precipitaion:mean value.

Table 2
Variable information

Variable	Value	Input/output	Description
lat	22.258651999999998	Input	Latitude
lon	71.1923805	Input	longitude
temp:mean	300.02	Output	Mean temperature in kelvin
humidity:mean	81	Output	Mean humidity in percentage
precipitaion:mean	674	Output	Mean precipitation in mm

By grading the output, according to table 1, we are having temperature as high grade and humidity with extreme grade. Crops are highly dependent on precipitation and indoor plants and succulents are most of the independent of humidity. On analyzing the sample data table which is shown in below

table, we have found our match as neem tree and Downy Jasmine. Then recommender will give the recommend from the database.

Table 3

Sample database

Plant name	Type	Temperature	Humidity
Jade plant	Succulent Plant	High, Moderate	Low
Northern red oak	Tree	Low, Moderate	High, Extreme
Plum tree	Tree	Low	Extreme
Neem tree	Tree	Moderate, High	Extreme
Four O'Clock Plant	Herbaceous perennial	Extreme	Low, Moderate
Euphorbia milli	Succulent Shrub	Low	Low
Downy Jasmine	Elegant Plant	High, Moderate	Extreme

5. Conclusion

According to our specific location, the recommended plants are neem and downy jasmine plants. If the user wants, he can filter to his liking. For example, if you want to recommend a tree more than a neem tree and if you want a more beautiful plant than jasmine.

But as we can see, soil plays a very important role, especially in planting crops. Soil temperatures are calculated from the Earth's Surface Temperature (LST) and the Normalized Difference Vegetation Index (NDVI) obtained from images of the MODIS satellite sensor aboard NASA's Aqua / Terra spacecraft.

6. References

- [1] Ali Raza, Ali Razzaq, Sundas Saher Mehmood, Xiling Zou, Xuekun Zhang, Yan Lv, and Jinsong Xu, "Impact of Climate Change on Crops Adaptation and Strategies to Tackle Its Outcome, Plants (Basel)", v.8(2), 2019, publish online.
- [2] Goral Godhani, Maulik Dhamecha, "A Study on Movie Recommendation System Using Parallel MapReduce Technology", IJEDR (2017)
- [3] Maulik Dhamecha, Dr. Amit Ganatra, Dr. C. K. Bhensadadiya, "Comprehensive Study of Hierarchical Clustering Algorithm and Comparison with Different Clustering Algorithms", CiiT (2011)
- [4] F.O. Isinkaye, Y.O. Folajimi, B.A. Ojokho, Recommendation systems: Principles, methods and evaluation, Egyptian Informative Journal, v(16), 2015, 261-273.
- [5] Muzamil Malik¹, Amna Ikram², Syeda Naila Batool², and Waqar Aslam "A Performance Assessment Of Rose Plant Classification Using Machine Learning" Springer 2019
- [6] Hossam M. Zawbaa, Mona Abbass, Sameh H. Basha, Maryam Hazman, Abul Ella Hassenian "An Automatic Flower Classification Approach Using Machine Learnings", IEEE, 1 Dec 2014 International Conference On Advance in Computing, Communication and Informatics, 24-27 Sep. 2014
- [7] Dhaval Chandarana, Maulik Dhamecha, "A Survey for Different Approaches of Outlier Detection in Data Mining", IEEE (2015)
- [8] Maulik Dhamecha, Dr. Tejas Patalia, "Fundamental Survey of Map Reduce in Bigdata with Hadoop Environment", Springer – CCIS (2018)
- [9] Krishna Parmar, Nivid Limbasiya, Maulik Dhamecha, "Feature based Composite Approach for Sarcasm Detection using MapReduce", IEEE (2018)

- [10] Neda Ahmadi , Mehrbakhsh Nilashib , Sarminah Samad , Tarik A. Rashid , Hossein Ahmadi “An intelligent method for iris recognition using supervised machine learning techniques” Elsevier 2019
- [11] Riddhi H. Shaparia¹ , Dr. Narendra M. Patel² and Prof. Zankhana H. Shah³ “Flower Classification Using Texture and Colour Features”,International Conference on Research and Innovations in Science, Engineering &Technology ,ICRISET 2017
- [12] Maulik Dhamecha, Dr. Tejas Patalia, “MapReduce Foundation of Big data with Hadoop environment”, ELSEVIER - SSRN (2018)
- [13] Maulik Dhamecha, Krupa Dobaria, Dr. Tejas Patalia, “A Survey on Recommendation System for Bigdata using MapReduce Technology”, IEEE (2019)
- [14] Busra Rumesya Mete, Tolga Ensari “Flower Classification with Deep CNN and Machine Learning Algorithm ”, IEEE 2019
- [15] Maulik Dhamecha, Dr. Tejas Patalia, “Comparative study of Dynamic Load Balancing algorithm in large scale data (Big data)”, IJAST (2020)
- [16] Jhon Edwin Vera Vera, Sergio Mora Martinez, Andrés Torres Pérez, Jonathan Avendano “Classification of Gerbera Type Flowers Based in Decision Tree Rules” IEEE 2019
- [17] Riddhi H.Shaparia^{1*} , Narendra M. Patel ² , Zankhana H.Shah ³ “Flower Classification using Different Color Channel” International Journal of Scientific Research in Computer Science and Engineering ,IJSRCSE April 2019
- [18] [https://en.wikipedia.org/wiki/Anaconda_\(Python_distribution\)](https://en.wikipedia.org/wiki/Anaconda_(Python_distribution))
- [19] <https://docs.conda.io/en/latest/>
- [20] https://en.wikipedia.org/wiki/Project_Jupyter
- [21] Python-(programming language - Wikipedia)