

PLANTi

Problem Statement : Crop yield prediction

Faculty Mentor: Dr. Saket Anand

Team Name : PLANTi

1. Sunishka Sharma
2. Sejal Kardam
3. Samriddh Singh
4. Yogesh Kaushik
5. Jai Singh



INDRAPRASTHA INSTITUTE *of*
INFORMATION TECHNOLOGY
DELHI



PROBLEM



Agriculture is the primary source of livelihood for about 58% of India's population and contributes 17–18% to country's GDP. However, today's agriculture policies fail to recognise how crop choices, input costs, and the climate change are intertwined, perpetuating marginal profits farming. One bad yield, whether due to errant rains, pests, etc., and most farmers have no buffer available. The problem of small farmers' livelihood is aggravated due to the fact that small farmers suffer from many production risks leading to large yield gaps, lack of assured and adequate irrigation, crop failure and so on. The production risk coverage which was being attempted through crop insurance by government has not worked well at all, as there isn't much predictability to be put into perspective. In the end, farmers end up suffering huge losses. Thus, it is of utmost importance that India shifts from basic farming to more efficient, sustainable, and productive farming which recognises changing climate, and prepares for it.

PROBLEM



- Because half of the country's farmland is dependent on rainfall, the country's agriculture industry is regarded very sensitive to changes in weather patterns, attracting 60 percent of farmers into the climate-proofing discussion.
- Extreme weather events are becoming more often as a result of climate change, as seen by rainfall statistics from the last 100 years.
- According to government data, such incidents have become more common in recent years, inflicting substantial agricultural loss.
- We will attempt to predict crop loss due to climatic changes and probable crop yield by analysing future meteorological data, current trends of current yields , and previous year data to better prepare farmers for the near future .

SOLUTION



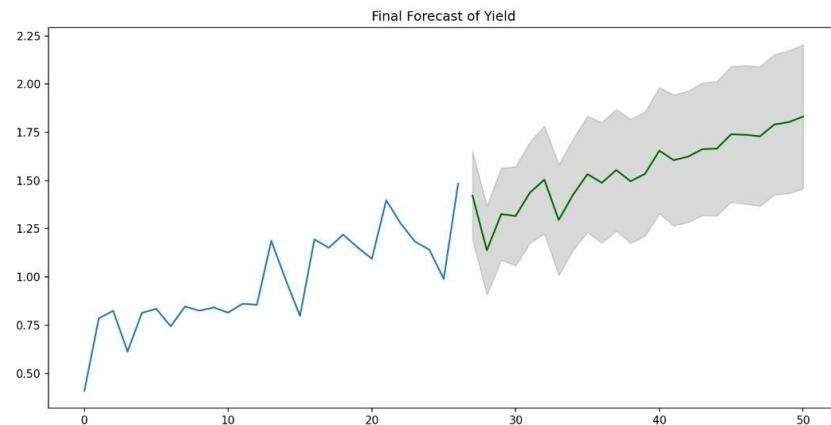
Our team has used **Machine Learning(ML) Models** and **Web Development** to deal with the problem that farmers face regarding the loss of crops due to diseases. We plan to take data in conjunction with the the data provided by the meteorological department. We will use that data to understand climatic conditions and crop's dependence on it in a region and then make use of that data to predict crop yield, rainfall, and fertilizer usage. These predictions can help farmers prepare for the future

This can help farmers take precautions like using required organic and inorganic compounds like fertilizers, pesticides etc, beforehand to decrease the loss of crops, or even resort to availing crop insurance. To implement the above proposed solution, we have used **ARIMA ML model**.

SOLUTION



ARIMA, short for '**Autoregressive Integrated Moving Average**' is actually a class of models that explains a given time series based on its own past values, that is, its own lags and the lagged forecast errors, so that equation can be used to **forecast future values**. This will prove valuable in making predictive models for crop yields based on older trends of climate and yield.



Potential impact



- Climate change is reducing global rice yield by 0.3% and wheat yields by 0.3% every year due to climatic changes!
- Many northern states in India have fallen ill to this catastrophe, and already destitute farmers end up paying the price for our collective fault.
- Climate change has a more significant impact on India's agriculture than ever before. Still, millions of small and marginal farmers lack proper protection, according to a study issued by CSE. According to the report "Lived Anomaly," the area affected by strange weather occurrences in 2015 increased to 18.33 million hectares from 0.35 million hectares in 2013, resulting in crop losses worth Rs 20,453 crore.

Potential impact



- The aforementioned paper highlights the Indian system's incapacity to cope with climate change weather events on farms, pointing out that compensation is limited to two hectares of land, is less than half of the real damage on that plot, and arrives many months after the significant loss.
- Our solution helps predict this, so probable measures and reinforcements can be implemented before too late. It will also place some responsibilities on local governments and communities to prepare for what is about to come, as they will have a decent idea of it

Demonstration (Webapp)



Sign In Page

Username :

Password :

⏪ Reply ⏪ Reply all → Forward 📁 Archive 🗑 Delete 🚩 Set flag ⋮

Confirm Your Email Please !!!

 **jai20070@iiitd.ac.in** <jai20070@iiitd.ac.in>
10-01-2022 21:40

To: samriddh20466@iiitd.ac.in

Welcome to Crop Yield Prediction , Login Page

Hello Samriddh1!

Please Confirm Your Email Id by Clicking on the Following Link

Confirmation Link: <http://127.0.0.1:8000/activate/MTQ/az21jo-3e6a8bcce035ec362007a65b28e6975f>

Welcome to PLANTi

Sign Up Page

Username :

First Name :

Last Name :

Email Address :

Password :

Confirm your Password :

Welcome to PLANTi

Know About Your Cropyield
Enter Information

Hello Jai

You are Successfully Logged In !!!

State :

District :

Crop :

Year :

Demonstration (Arima)



Figure 1

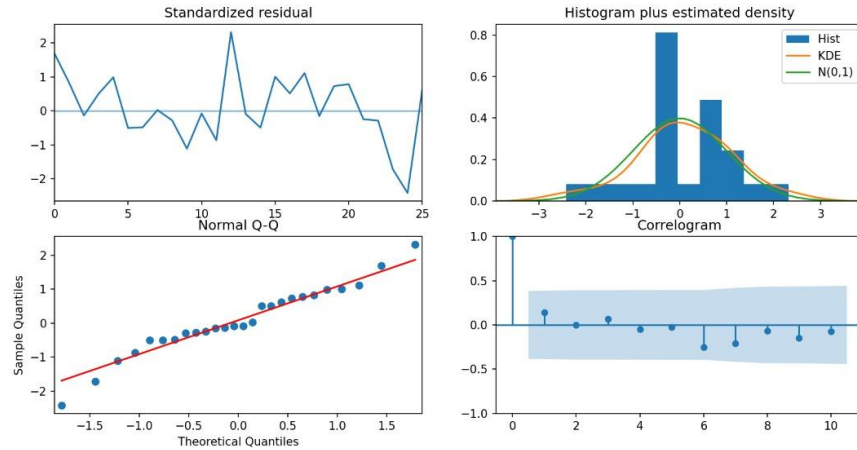
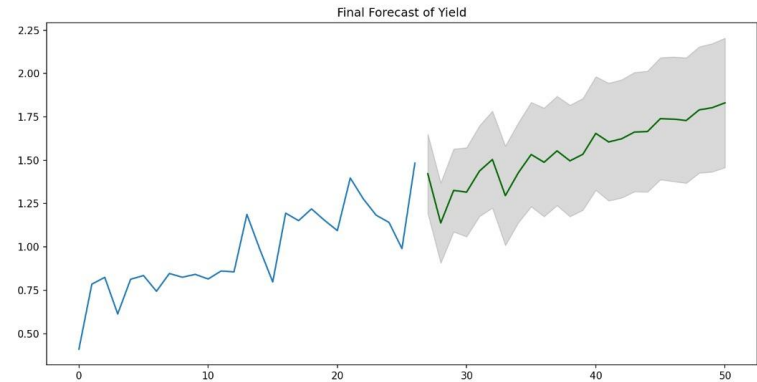


Figure 1



Demonstration



Figure 1

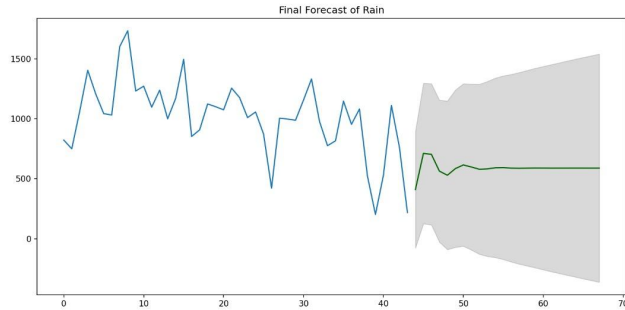


Figure 1

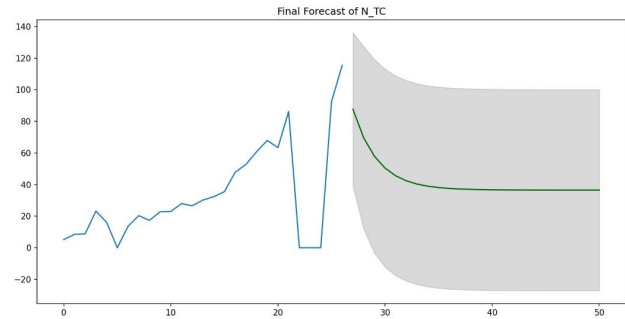


Figure 1

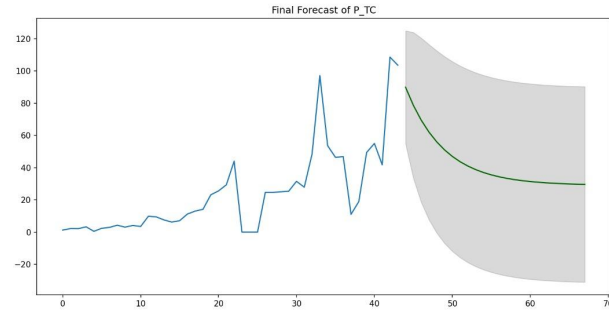
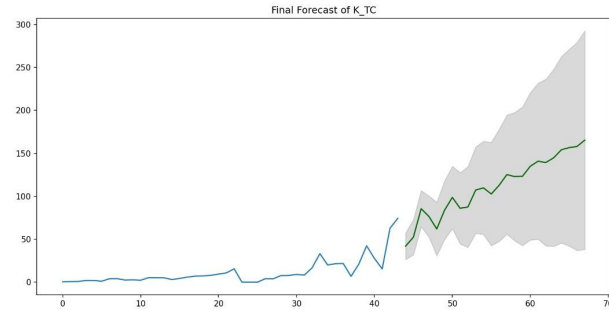


Figure 1



Demonstration (Arima)



```
VARIMA.py - Anveshan - Visual Studio Code

1 import hana.ml

(AnveshanVENV) PS C:\Users\hp\Desktop\Anveshan\Anveshan\DataSets\Bihar> python -u "c:\Users\hp\Desktop\Anveshan\Anveshan\ML_MODELS\VARIMA.py"
901.0
Use manual ARIMA? (1 for yes): 0
=====
Yield
=====
Performing stepwise search to minimize aic
ARIMA(1,1,1)(0,0,0)[0] intercept : AIC=inf, Time=0.31 sec
ARIMA(0,1,0)(0,0,0)[0] intercept : AIC=-8.366, Time=0.04 sec
ARIMA(1,1,0)(0,0,0)[0] intercept : AIC=-10.262, Time=0.05 sec
ARIMA(0,1,1)(0,0,0)[0] intercept : AIC=inf, Time=0.39 sec
ARIMA(0,1,0)(0,0,0)[0] intercept : AIC=-9.177, Time=0.05 sec
ARIMA(2,1,0)(0,0,0)[0] intercept : AIC=-16.344, Time=0.20 sec
ARIMA(3,1,0)(0,0,0)[0] intercept : AIC=-15.359, Time=0.10 sec
ARIMA(2,1,1)(0,0,0)[0] intercept : AIC=inf, Time=0.20 sec
ARIMA(3,1,1)(0,0,0)[0] intercept : AIC=-18.989, Time=0.28 sec
ARIMA(4,1,1)(0,0,0)[0] intercept : AIC=-20.540, Time=0.26 sec
ARIMA(4,1,0)(0,0,0)[0] intercept : AIC=-22.644, Time=0.11 sec
ARIMA(5,1,0)(0,0,0)[0] intercept : AIC=-21.097, Time=0.18 sec
ARIMA(5,1,1)(0,0,0)[0] intercept : AIC=-19.098, Time=0.24 sec
ARIMA(4,1,0)(0,0,0)[0] intercept : AIC=-14.020, Time=0.09 sec

Best model: ARIMA(4,1,0)(0,0,0)[0] intercept
Total fit time: 2.535 seconds

SARIMAX Results
=====
Dep. Variable: y No. Observations: 27
Model: SARIMAX(4, 1, 0) Log Likelihood: 17.322
Date: Tue, 11 Jan 2022 AIC: -22.644
Time: 04:23:20 BIC: -15.096
Sample: 0 HQIC: -20.470
```

Demonstration



<https://github.com/MasterChief02/Anveshan>

You can check our project repository by clicking the above link.



Future Prospect

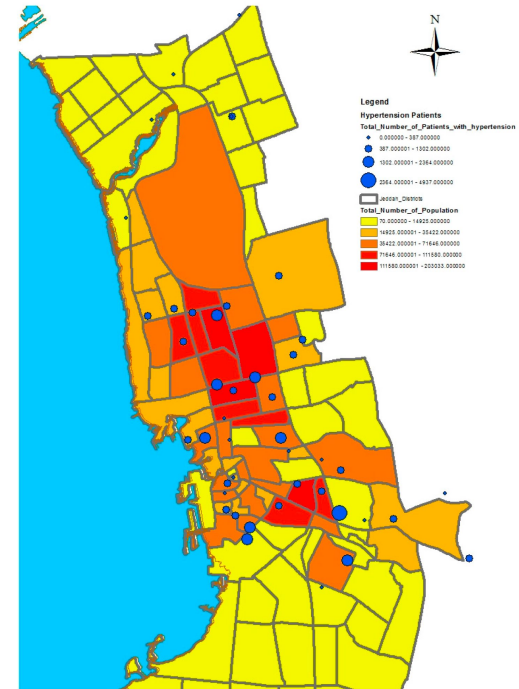


Disease prediction (propagation and concentration)

Bioacoustics integration

Crop insurance

Other conditions- groundwater, soil health



Resources used



1. Django for web developement
2. Data From Meteorological Department via APIs
3. Total Cost - Rs 0 (INR)
4. Crop data from data.gov.in and <http://vdsa.icrisat.ac.in/>

Expertise:

1. Yogesh Kaushik
 - .Expertise - Machine Learning , Web Development .
 - .Prior Experience - Web developer for D4rkcode, Tic Tac Toe bot using reinforcement learning

Resources used (cont.)



2. Sejal Kardam

.Expertise - Java , Python , C++ , Web Development, Web design.

.Prior Experience - E Yantra Innovation Challenge(Participant).

3. Samriddh Singh -

.Expertise - Java , Python , C++ , C , Game Development, ML.

.Prior Experience - Game Design Hackathon(Secure 1 Rank) .

4. Sunishka Sharma -

.Expertise - Web Development , Java , Python , C++ , C, Pandas.

.Prior Experience -Space research intern at Spartificial

5. Jai Singh -

.Expertise - Java , Python , C++ , C , Web Development.

.Prior Experience - Competitive Programming(Codeforces , Code Chef, etc)

Theme Alignment



- Application Area:
 - Agriculture and Rural Development
 - Sustainable Environment

- Technology Focus Area:
 - Web Development
 - Machine Learning

