# MODEL TO DETECT RAINFALL

# Will Griner

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# Problem

## Rainfall Disasters

**Iowa farmers are slammed by flooding**

Farmers scramble to move stored crops as water inundates parts of southwest Iowa. Disaster declared for 43 counties.

iowafarmbureau.com / Mar 25, 2019

# Problem

## Drought

**'This could be the year where things really take a hit:' What Iowa needs to end the drought**

"We need regular rains, we need rains every couple of weeks," corn and soybean farmer Mike Brelsford said.

KCCI / Dec 17, 2023

# DATA DESCRIPTION

1

Given a dataset for weather data from 2006 to 2023.

2

Dataset included temperature, wind speed, humidity, and precipitation.

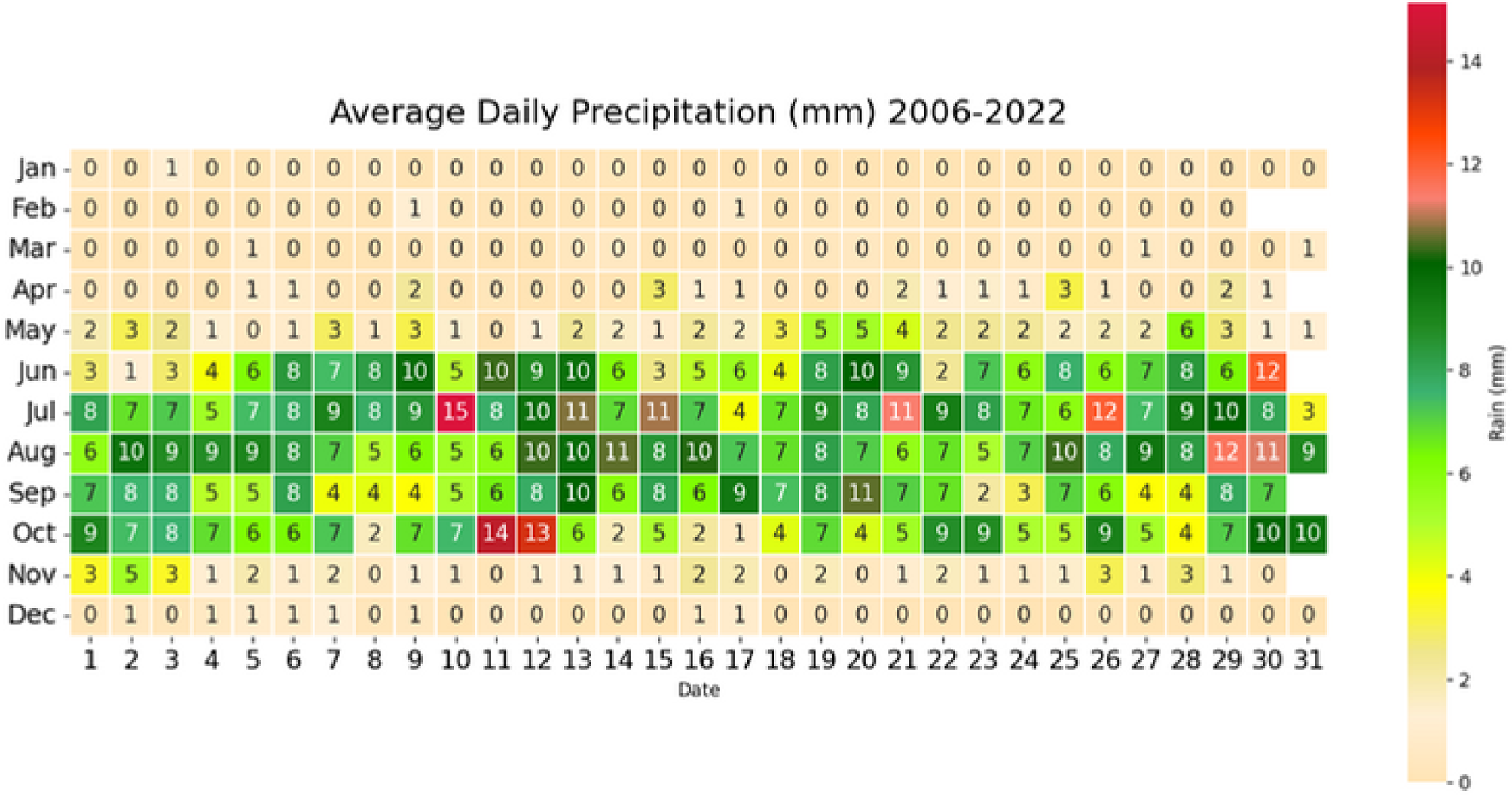
3

Weather data was collected in India.

# DATA DESCRIPTION

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Date | MaxT | MinT | WindSpeed | Humidity | Precipitation |
| 2 | 2006-01-08 00:00:00 | 29.5 | 21.8 | 1.6 | 70.2 | 0.0 |
| 3 | 2006-01-09 00:00:00 | 30.1 | 21.0 | 1.6 | 67.4 | 0.0 |
| 4 | 2006-01-10 00:00:00 | 29.9 | 21.1 | 1.7 | 65.2 | 0.0 |
| 5 | 2006-01-11 00:00:00 | 29.8 | 20.8 | 1.5 | 69.0 | 0.0 |
| 6 | 2006-01-12 00:00:00 | 29.6 | 20.5 | 2.1 | 69.5 | 0.0 |
| 7 | 2006-01-13 00:00:00 | 29.7 | 19.8 | 2.1 | 62.6 | 0.0 |
| 8 | 2006-01-14 00:00:00 | 29.7 | 19.7 | 2.1 | 62.5 | 0.0 |
| 9 | 2006-01-15 00:00:00 | 29.4 | 19.9 | 1.8 | 67.3 | 0.0 |
| 10 | 2006-01-16 00:00:00 | 30.3 | 19.9 | 1.3 | 66.4 | 0.0 |
| 11 | 2006-01-17 00:00:00 | 31.0 | 20.7 | 1.3 | 67.7 | 0.0 |
| 12 | 2006-01-18 00:00:00 | 31.5 | 20.6 | 1.4 | 68.9 | 0.0 |
| 13 | 2006-01-19 00:00:00 | 32.1 | 20.4 | 1.6 | 61.2 | 0.0 |
| 14 | 2006-01-20 00:00:00 | 33.9 | 20.9 | 1.7 | 58.3 | 0.0 |
| 15 | 2006-01-21 00:00:00 | 32.7 | 21.0 | 1.4 | 57.3 | 0.0 |

# DATA VISUALIZATION



# DATA CLEANING

Bad data

Unrelated data

Data prediction

# WEATHER PREDICTION

According to Wikipedia, light rain occurs when the precipitation is less than 2.5mm, moderate rain occurs between 2.5mm to 10mm, heavy rain occurs between 10mm and 50mm, while violent rain occurs when precipitation is greater than 50mm.

# DATA ANALYSIS

| Date | MaxT | MinT | WindSpeed | Humidity | Precipitation |
|---|---|---|---|---|---|
| 2006-01-08 00:00:00 | 29.5 | 21.8 | 1.6 | 70.2 | 0.( |
| 2006-01-09 00:00:00 | 30.1 | 21.0 | 1.6 | 67.4 | 0.( |
| 2006-01-10 00:00:00 | 29.9 | 21.1 | 1.7 | 65.2 | 0.( |
| 2006-01-11 00:00:00 | 29.8 | 20.8 | 1.5 | 69.0 | 0.( |
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| 2006-01-17 00:00:00 | 31.0 | 20.7 | 1.3 | 67.7 | 0.( |
| 2006-01-18 00:00:00 | 31.5 | 20.6 | 1.4 | 68.9 | 0.( |
| 2006-01-19 00:00:00 | 32.1 | 20.4 | 1.6 | 61.2 | 0.( |
| 2006-01-20 00:00:00 | 33.9 | 20.9 | 1.7 | 58.3 | 0.( |
| 2006-01-21 00:00:00 | 32.7 | 21.0 | 1.4 | 57.3 | 0.( |
| 2006-01-22 00:00:00 | 33.2 | 20.4 | 2.0 | 61.1 | 0.( |
| 2006-01-23 00:00:00 | 33.0 | 21.1 | 2.5 | 49.2 | 0.( |
| 2006-01-24 00:00:00 | 31.4 | 20.9 | 2.3 | 52.6 | 0.( |
| 2006-01-25 00:00:00 | 29.0 | 20.2 | 2.5 | 57.1 | 0.( |
| 2006-01-26 00:00:00 | 27.0 | 19.6 | 1.8 | 56.3 | 0.( |
| 2006-01-27 00:00:00 | 29.3 | 18.1 | 2.3 | 57.8 | 0.( |
| 2006-01-28 00:00:00 | 29.3 | 16.8 | 2.1 | 56.6 | 0.( |
| 2006-01-29 00:00:00 | 29.8 | 17.7 | 1.9 | 55.9 | 0.( |

# DATA ANALYSIS

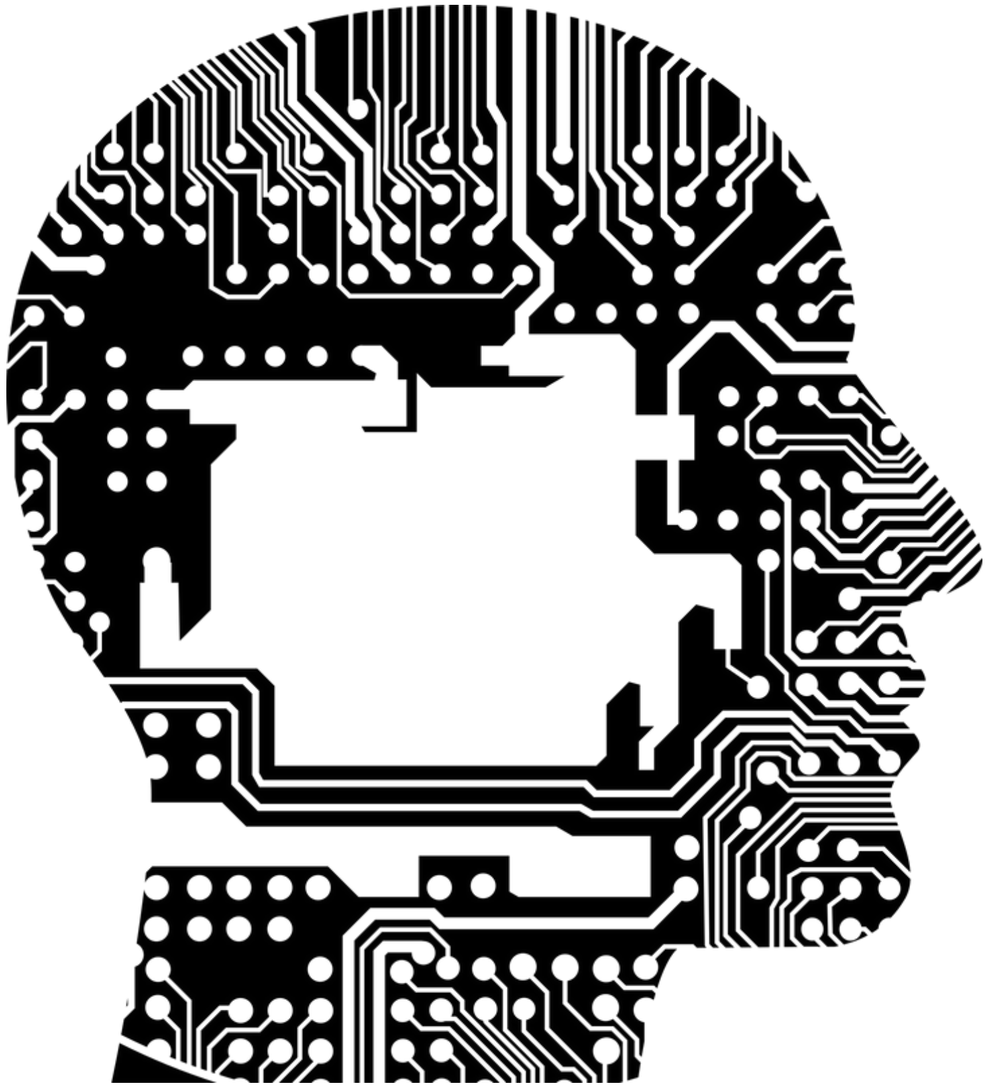
| | Year | Month | Day | MaxT | MinT | WindSpeed | Humidity | Precipitation | Rain |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 2006 | 1 | 8 | 29.5 | 21.8 | 1.6 | 70.2 | 0 | 0 |
| **1** | 2006 | 1 | 9 | 30.1 | 21 | 1.6 | 67.4 | 0 | 0 |
| **2** | 2006 | 1 | 10 | 29.9 | 21.1 | 1.7 | 65.2 | 0 | 0 |
| **3** | 2006 | 1 | 11 | 29.8 | 20.8 | 1.5 | 69 | 0 | 0 |
| **4** | 2006 | 1 | 12 | 29.6 | 20.5 | 2.1 | 69.5 | 0 | 0 |
| **5** | 2006 | 1 | 13 | 29.7 | 19.8 | 2.1 | 62.6 | 0 | 0 |
| **6** | 2006 | 1 | 14 | 29.7 | 19.7 | 2.1 | 62.5 | 0 | 0 |
| **7** | 2006 | 1 | 15 | 29.4 | 19.9 | 1.8 | 67.3 | 0 | 0 |
| **8** | 2006 | 1 | 16 | 30.3 | 19.9 | 1.3 | 66.4 | 0 | 0 |
| **9** | 2006 | 1 | 17 | 31 | 20.7 | 1.3 | 67.7 | 0 | 0 |
| **10** | 2006 | 1 | 18 | 31.5 | 20.6 | 1.4 | 68.9 | 0 | 0 |
| **11** | 2006 | 1 | 19 | 32.1 | 20.4 | 1.6 | 61.2 | 0 | 0 |
| **12** | 2006 | 1 | 20 | 33.9 | 20.9 | 1.7 | 58.3 | 0 | 0 |
| **13** | 2006 | 1 | 21 | 32.7 | 21 | 1.4 | 57.3 | 0 | 0 |
| **14** | 2006 | 1 | 22 | 33.2 | 20.4 | 2 | 61.1 | 0 | 0 |
| **15** | 2006 | 1 | 23 | 33 | 21.1 | 2.5 | 49.2 | 0 | 0 |
| **16** | 2006 | 1 | 24 | 31.4 | 20.9 | 2.3 | 52.6 | 0 | 0 |
| **17** | 2006 | 1 | 25 | 29 | 20.2 | 2.5 | 57.1 | 0 | 0 |
| **18** | 2006 | 1 | 26 | 27 | 19.6 | 1.8 | 56.3 | 0 | 0 |
| **19** | 2006 | 1 | 27 | 29.3 | 18.1 | 2.3 | 57.8 | 0 | 0 |
| **20** | 2006 | 1 | 28 | 29.3 | 16.8 | 2.1 | 56.6 | 0 | 0 |
| **21** | 2006 | 1 | 29 | 29.8 | 17.7 | 1.9 | 55.9 | 0 | 0 |
| **22** | 2006 | 1 | 30 | 29.7 | 18.5 | 2 | 53.3 | 0 | 0 |

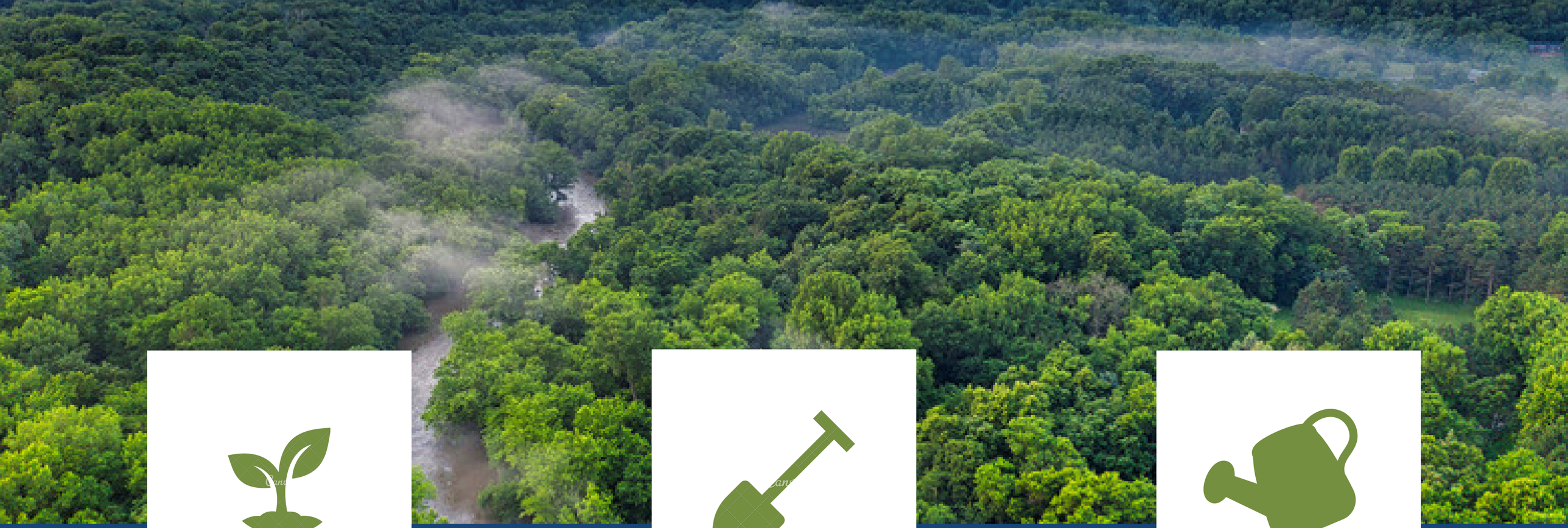
# SOLUTION

To create a model that can predict rainfall.

# ML MODEL

- Rainfall Prediction(mm)
- Rain/No Rain Prediction
- Rain Severity Prediction





Crop Protection

Agriculture Planning

Field Activities

# ALGORITHMS USED

- Random Forrest Classifier
- Gradient Boosting Classifier
- XGBoost & CategoricalBoost

Highest Overall Accuracy: **78%**

Mean Cross-Validation: **74%**

```
Accuracy with Cat Boost Classifier: 0.7856567284448026
CatBoost Performance:
                precision    recall  f1-score   support

      No Rain       0.86      0.94      0.90       881
   Light Rain       0.54      0.41      0.47        73
Moderate Rain       0.29      0.14      0.19       113
   Heavy Rain       0.61      0.58      0.59       170
 Extreme Rain       0.67      0.50      0.57         4

     accuracy                           0.79      1241
    macro avg       0.59      0.51      0.54      1241
 weighted avg       0.75      0.79      0.77      1241
```

# HOW DOES OUR SOLUTION IMPACT FARMERS?


Deploy
Rainfall Predictions Utilizing Machine Learning
Predict Rainfall
Day: 1
Year: 2023
Month: 8
Day: 15
Max Temperature: 82
Min Temperature: 65
Avg. Wind Speed: 12
Humidity: 75
Predicted Rainfall:
No Rain
Day: 2
Year: 2023
Predicted Rainfall:

# CHALLENGES

1

Data quality

2

Feature Selection

3

Accessibility

# FUTURE IMPLEMENTATION

## NOTIFICATIONS


Farmers receive notifications about upcoming rainfall.

## SEASONS

Model detects other seasons such as snow.

## NATURAL DISASTERS

Model detects upcoming natural disasters.

## HARVESTING

Model detects the optimal harvesting times.

# Thank You!

Jollof Boys