

# **ANOMALY DETECTION IN ENVIRONMENTAL SENSOR NETWORKS**

**ENHANCING CLIMATE MONITORING &  
RESOURCE OPTIMIZATION**

# INTRODUCTION

**01**

**Environmental sensor networks provide real-time data (temperature, humidity, light).**

**02**

**Anomalies compromise data reliability → affect climate actions and resource management.**

**03**

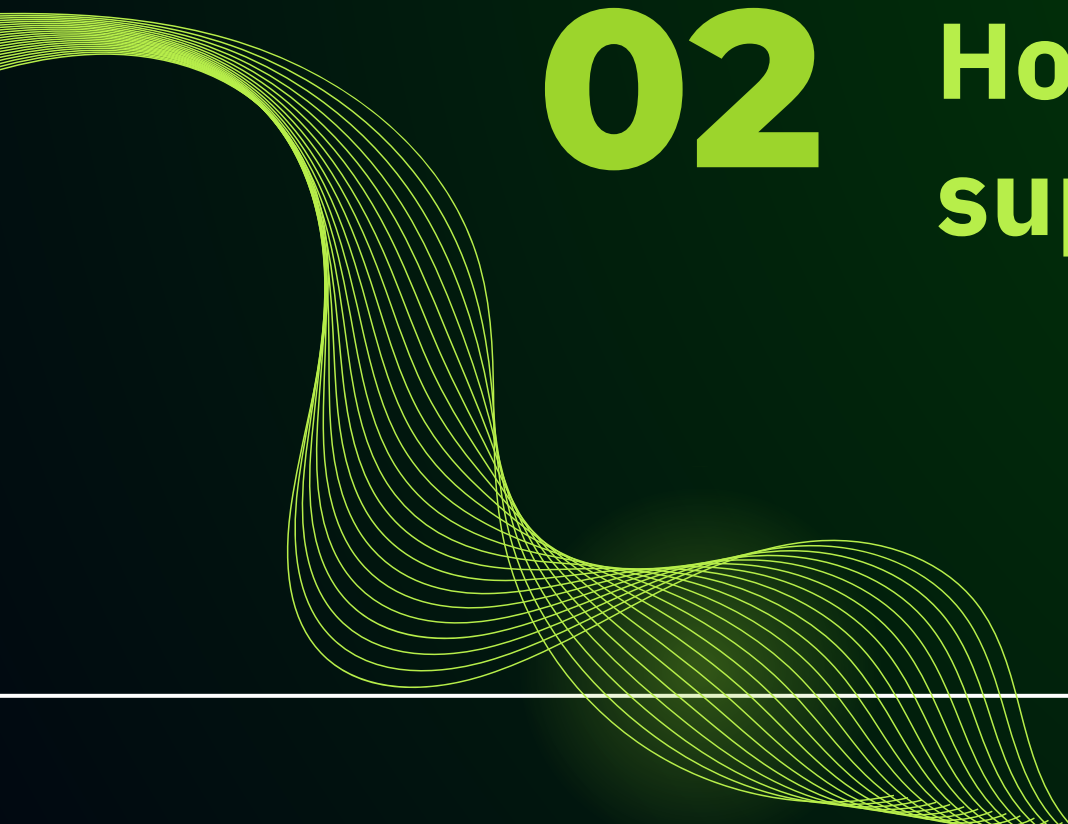
**Goal: Improve data accuracy to support SDG 13: Climate Action.**

# **DATASET OVERVIEW**

- 01** 5-minute interval readings (Temperature, Light, Humidity).
- 02** Geolocation data (Latitude, Longitude, Elevation).
- 03** Rich time-series + spatial data for deep analysis.

# PROBLEM STATEMENT

- 01** How can anomaly detection improve climate monitoring reliability?
- 02** How does this optimization support sustainable management?



# EXPLORATORY DATA ANALYSIS (EDA)

## 01 SEASONAL PATTERNS

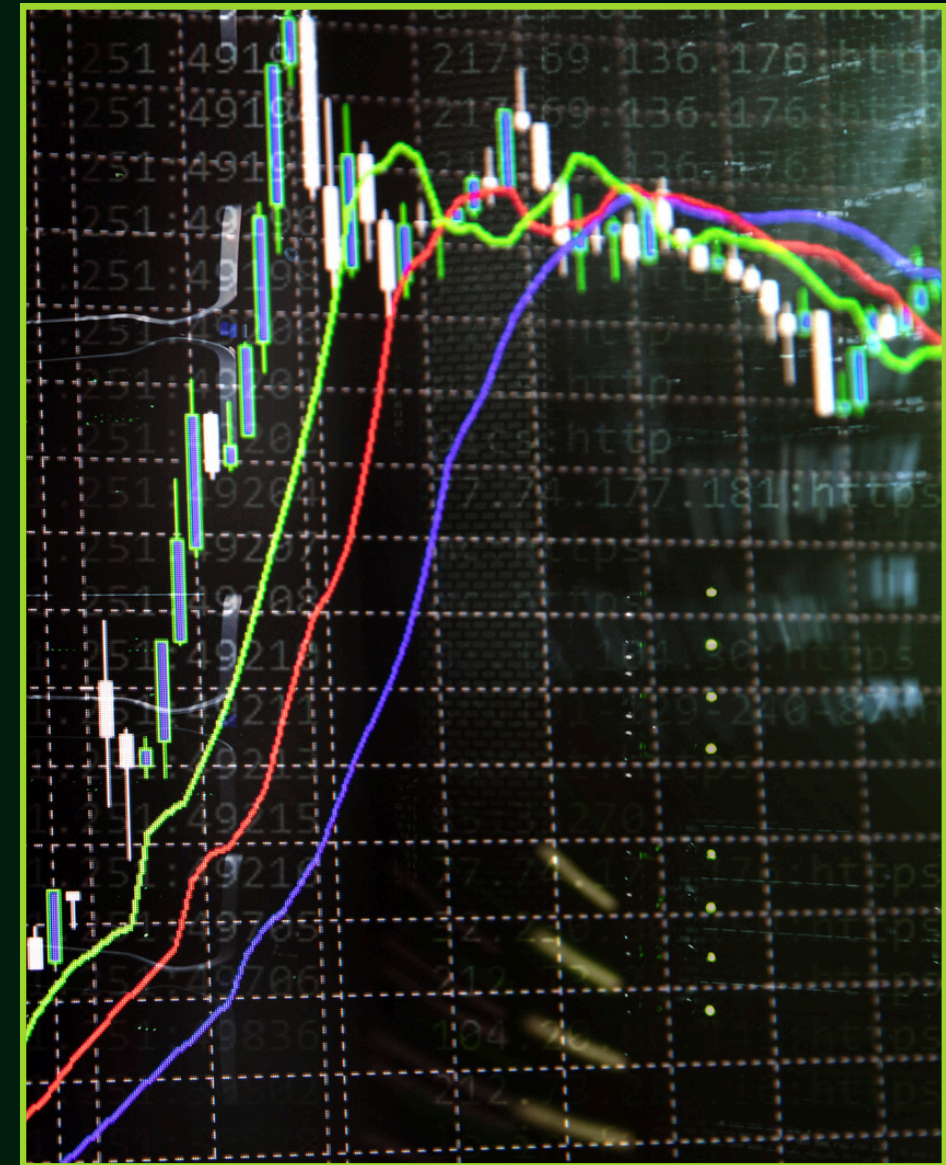
- January: High variability.
- June: Coldest and most stable.

## 02 OUTLIERS IDENTIFIED

Temperatures  $>45^{\circ}\text{C}$ , Humidity  $>100\%$   
(Sensor faults or true anomalies).

## 03 DATA INTEGRITY

- Missing values only in elevation field.
- No duplicate records.





# MODEL BUILDING

## ALGORITHM SELECTED

Random Forest Classifier.

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## FEATURES USED

Temperature avg, Humidity avg, Light avg.

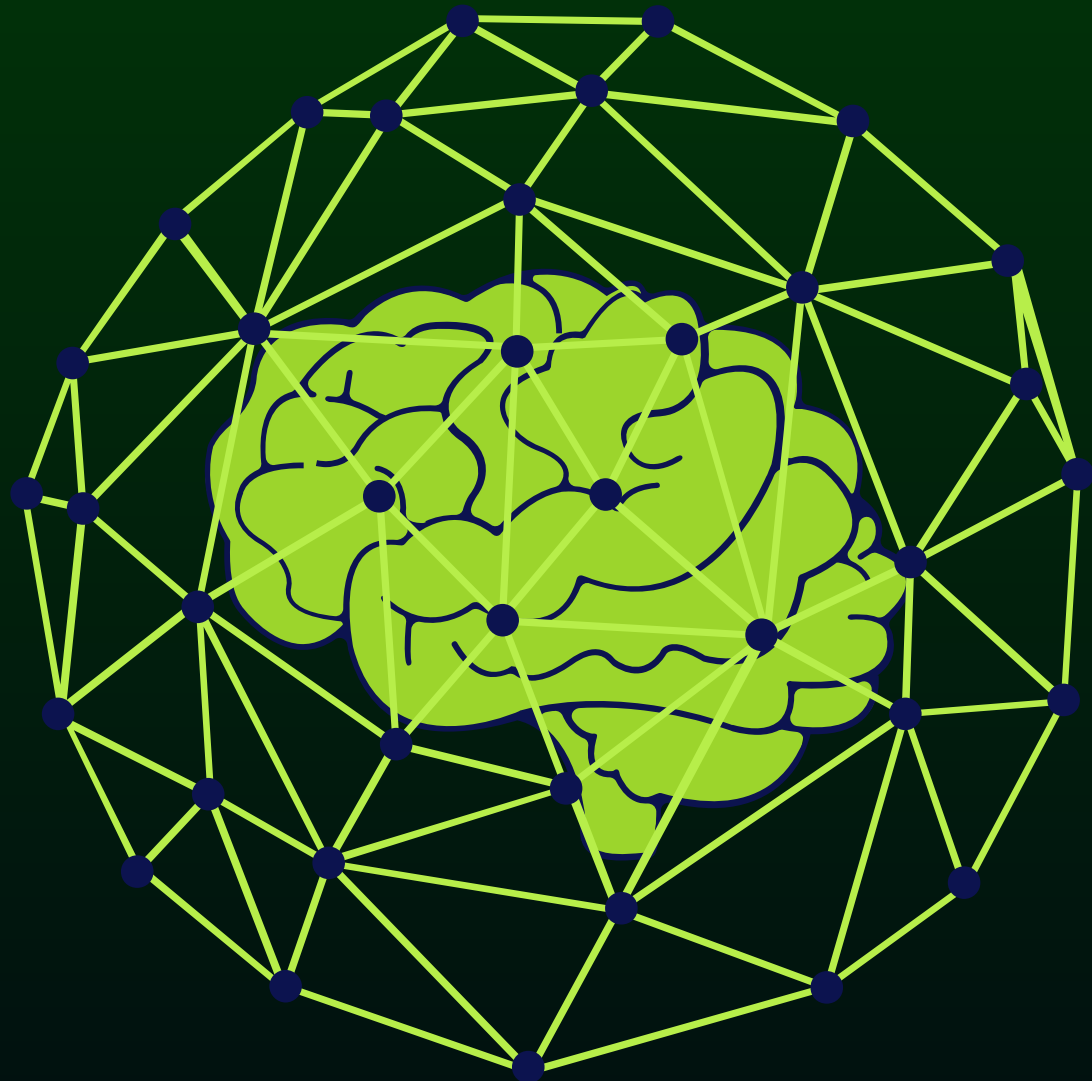
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## ANOMALY LABELING

Manual thresholding ( $>45^{\circ}\text{C}$  or  $>100\%$  humidity).

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# EXPERIMENTAL RESULTS



**Observation: Most observations were normal, very few anomalies.**

**Accuracy: 99.89%**

**Precision: 99.79%**

**Recall: 99.89%**

**F1 Score: 99.84%**

# KEY CONCLUSIONS

**01** Random Forest effectively detects environmental anomalies.

**02** High model performance with minimal false alarms.

**03** Reliable environmental monitoring enables better climate action strategies.



***THANK YOU!***