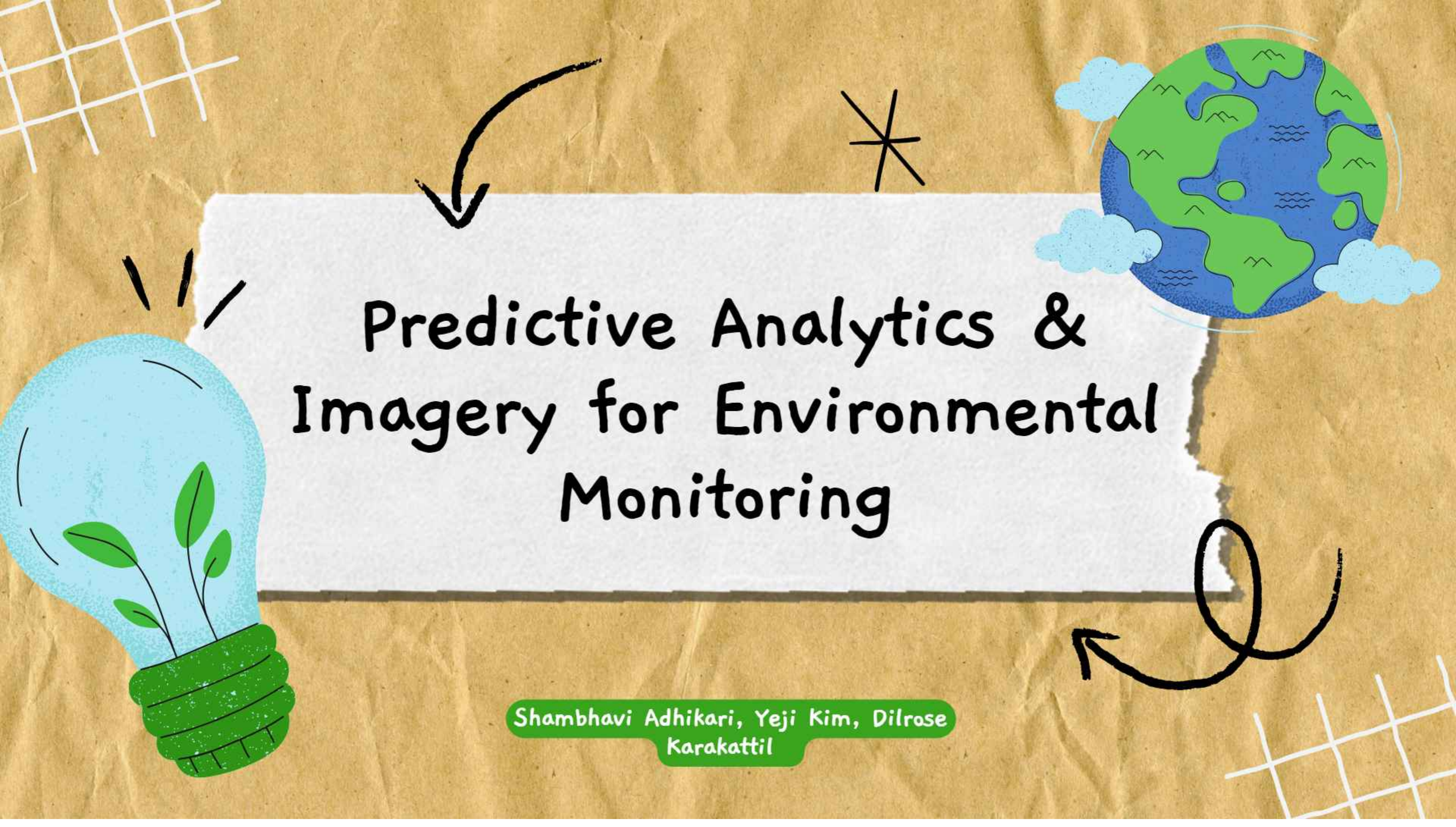


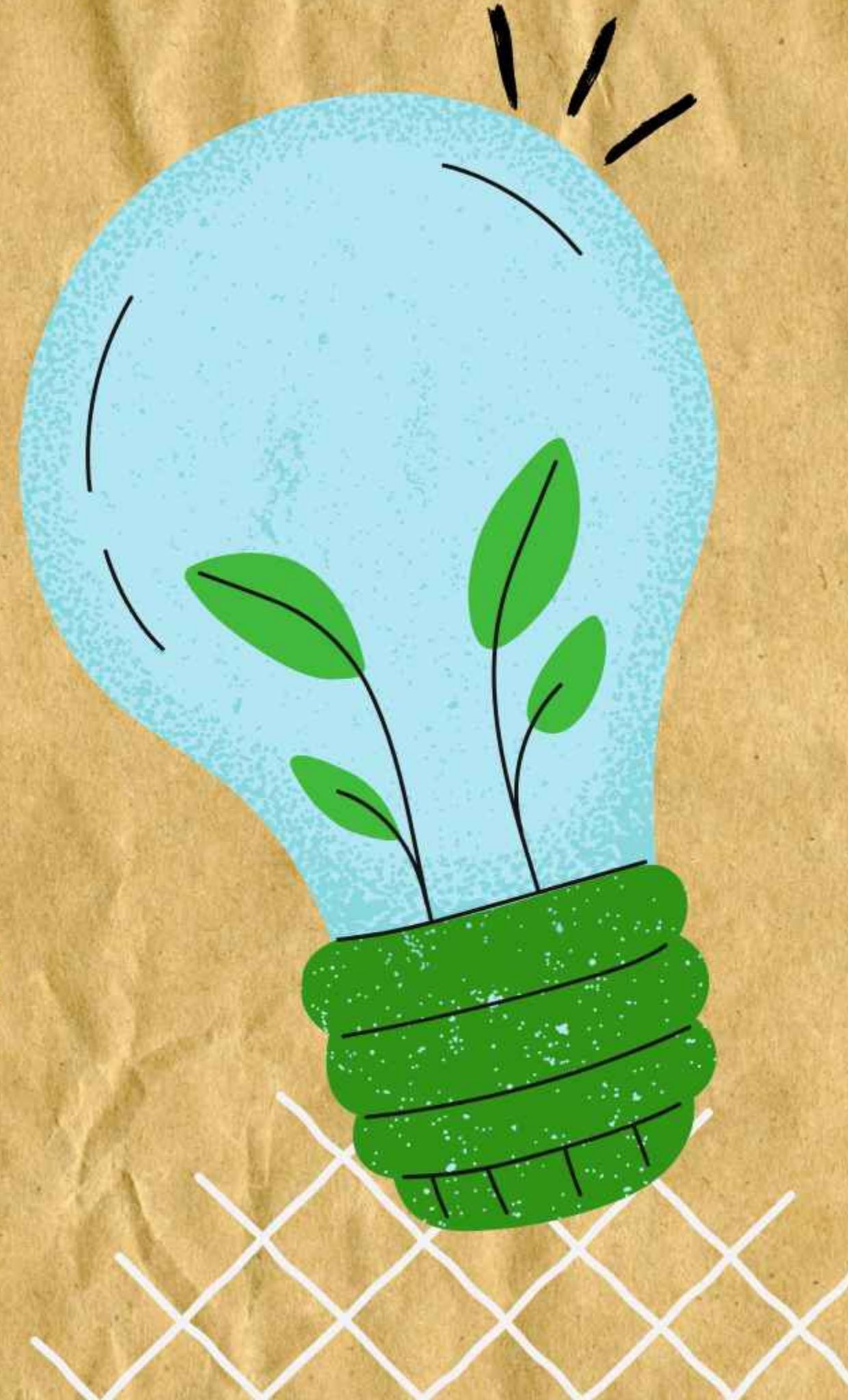


Predictive Analytics & Imagery for Environmental Monitoring

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Karakattil

Agenda

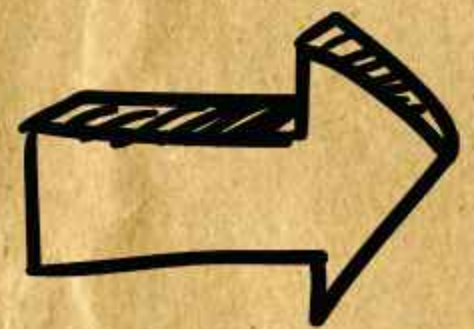
1. Introduction/Problem Statement
2. Objectives and Scope
3. Methodology and ML Models
4. Result and Analysis
5. Challenges and Future Development
6. Conclusion



Problem Statement



- Climate change impacts our lives in many ways:
 - Health Impacts
 - Food Security
 - Economic Impacts
 - Biodiversity Loss
- Climate change accelerates due to increasing deforestation and carbon emissions, leading to environmental risks.



Monitoring climate impacts

Objectives and Scope

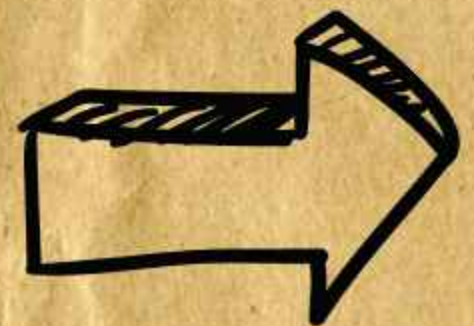


- Analyze factors causing carbon emissions through random forest algorithm
- Monitor deforestation using satellite imagery
- Predict upcoming flood

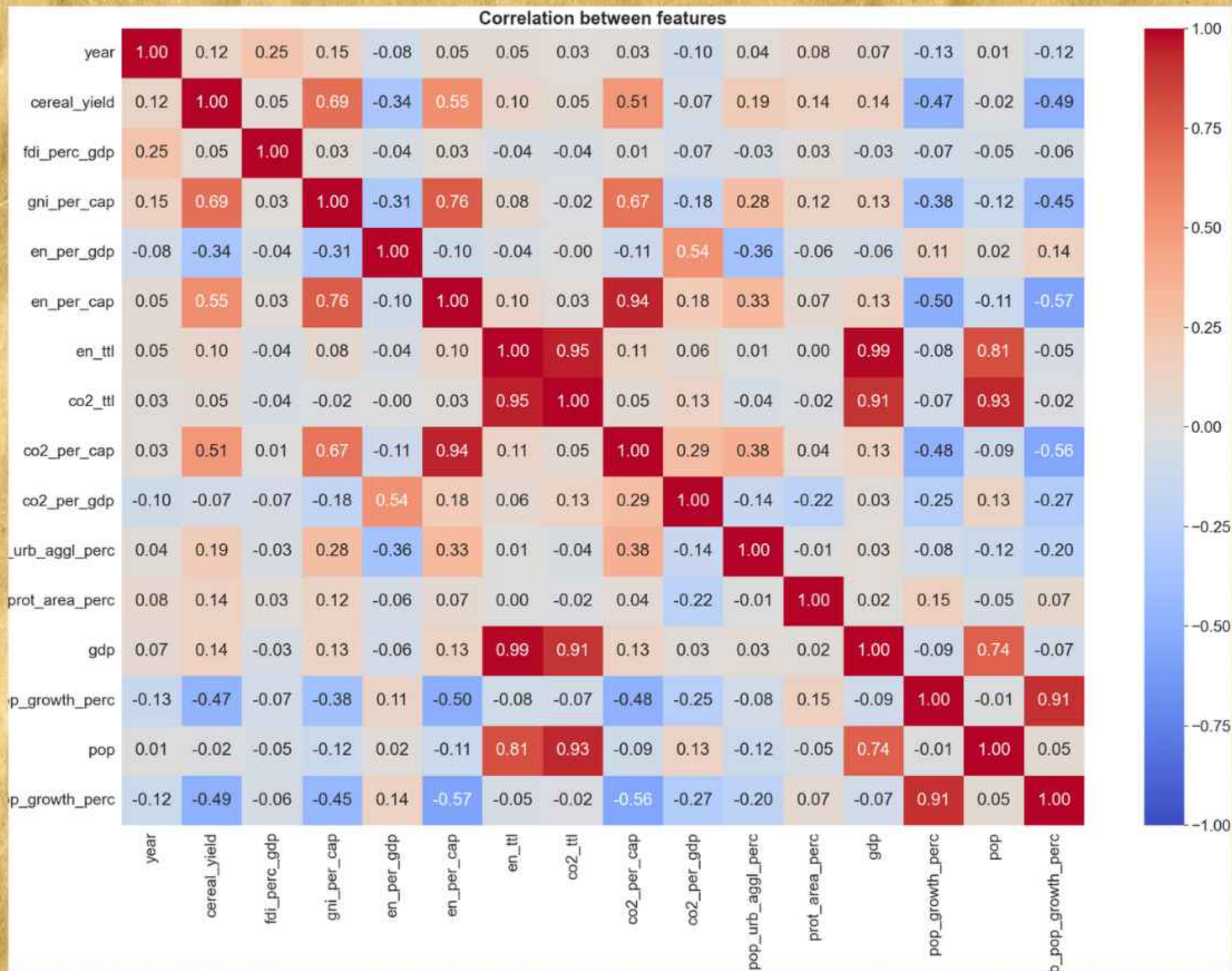
Methodology and ML Models



- Model Design: use **Random Forest** to analyze factors leading to carbon emission
 - Energy use per capita
 - Cereal yield
 - Population in urban agglomerations > 1million
 - Population growth



They are Highly Correlated!



- cereal_yield - Cereal yield
- en_per_cap - Energy use per capita (kilograms of oil equivalent)
- pop_urb_aggl_perc - Population in urban agglomerations>1 million (%)
- pop -Population

Result and Analysis

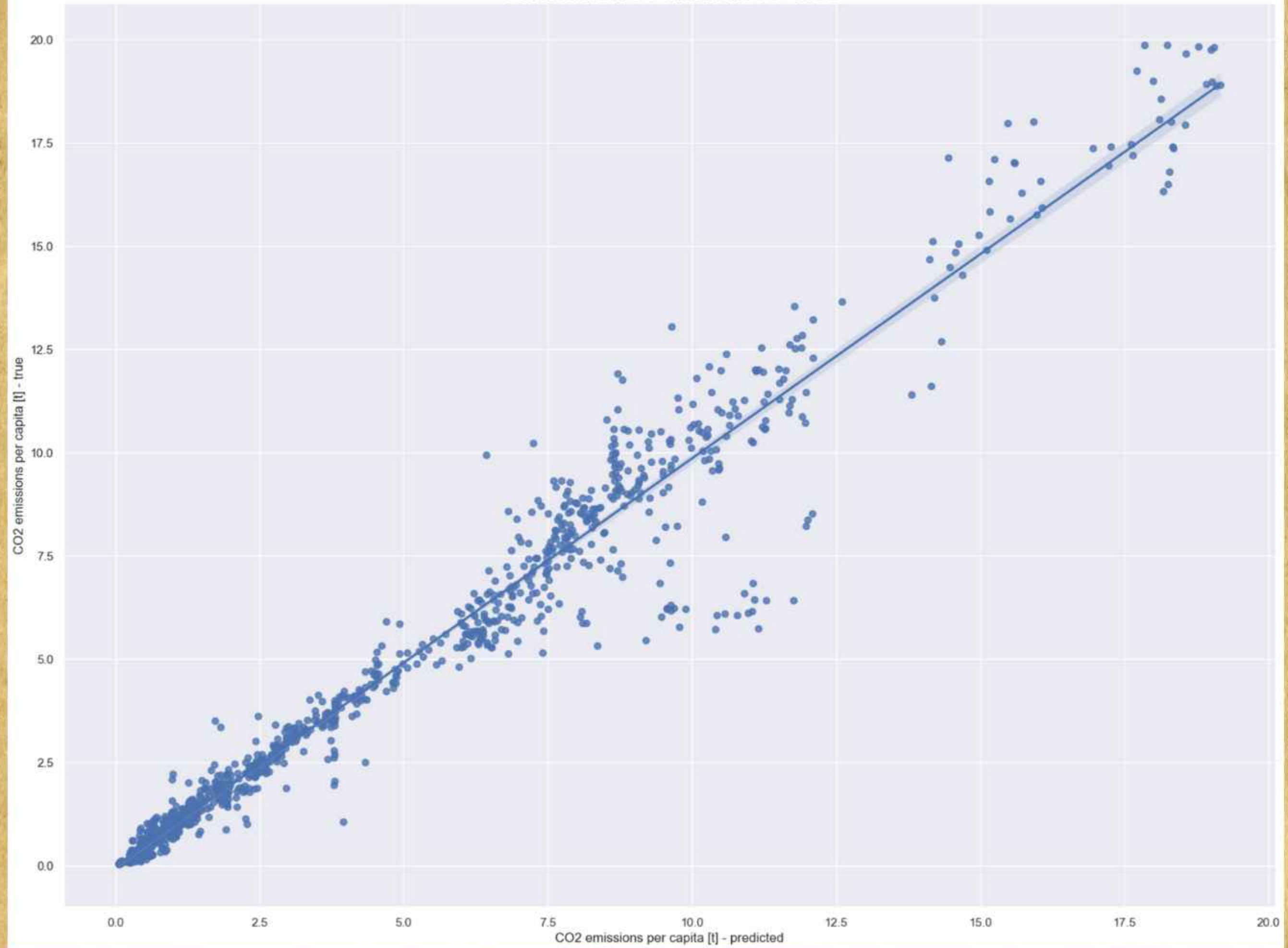
Two green leaves are positioned in the top right corner of the slide. One leaf is larger and more prominent, while the other is smaller and partially behind it. They are both a vibrant green color with visible veins.

Analyzing the Carbon Emission Trend

Obtained R2 score (a metric used to check the quality of prediction) of 0.96

- To avoid overfitting, the following measures have been taken:
- dataset splitting with only 30% of the observations as a training subset
- cross-validation

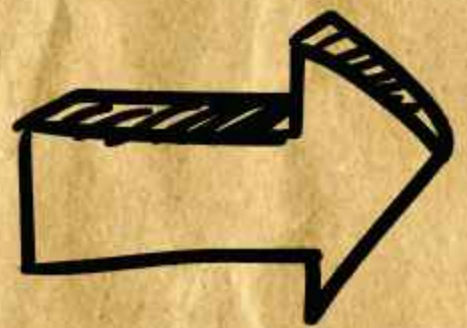
Correlation coefficient $R=0.98$



Methodology and ML Models



- Model Design: Custom U-Net models with configurable layers, filters, and optional batch normalization and dropout.
- Data Handling: Utilized ImageDataGenerator for loading and augmenting training/validation data.
- Training Setup: Saved best models with checkpoints, recorded metrics with CSV logger.



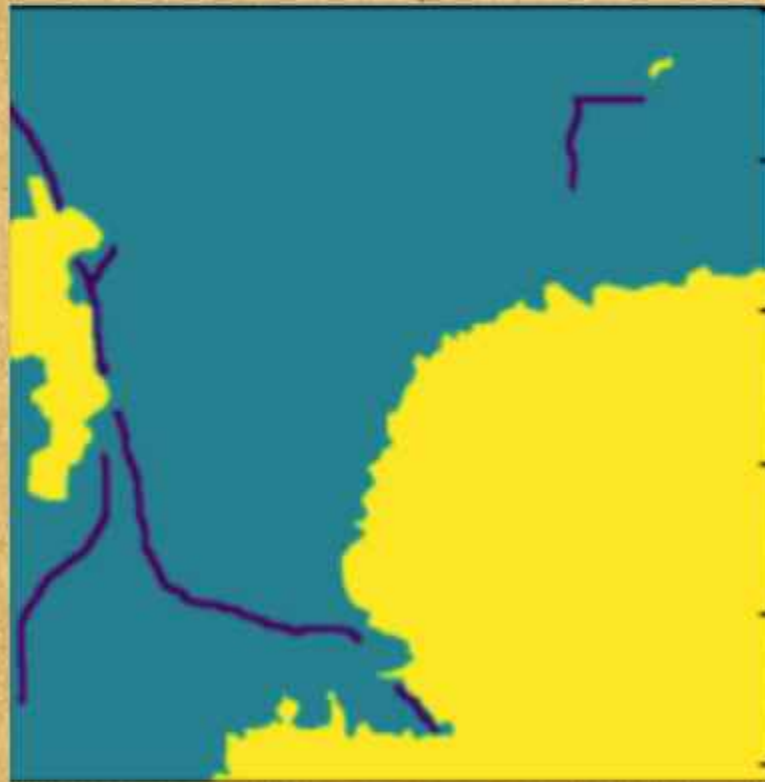
Find the deforestation area worldwide

Result and Analysis

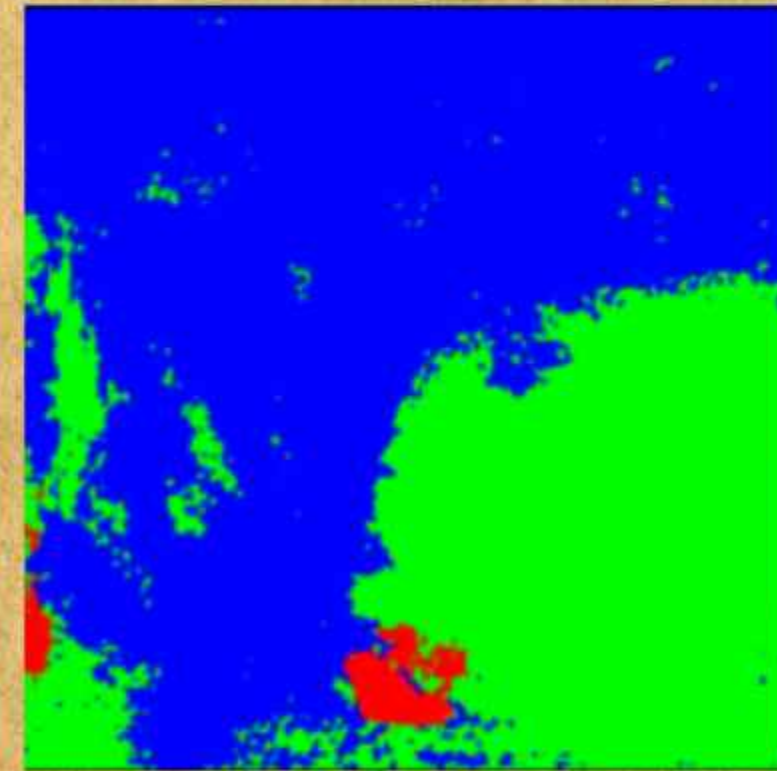
Sample Outputs: Visual comparison of predictions vs. ground truth.



Satellite Image



Ground Truth

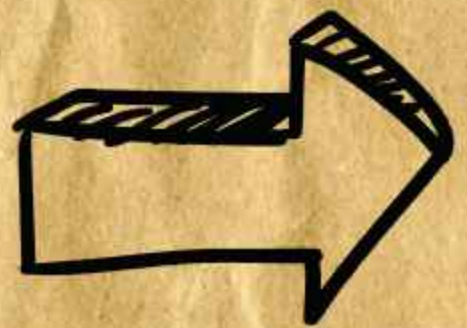


Prediction Image

Methodology and ML Models

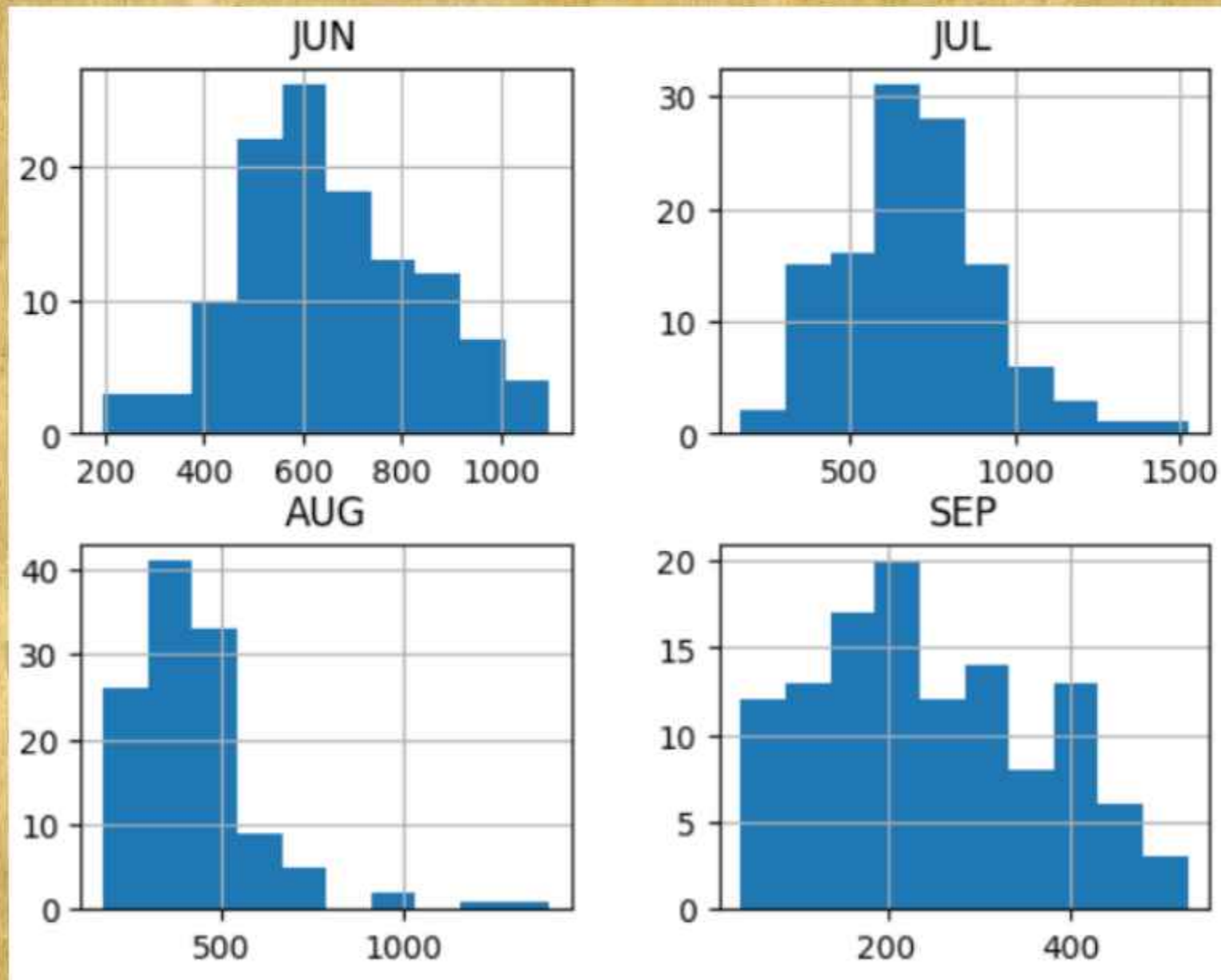


- Model Design: Scale or normalize features as needed, preparing them for the decision tree algorithm, which is sensitive to feature magnitudes.
- Split the dataset into training and testing sets.
- Use the decision tree algorithm to predict flood occurrence based on feature proximity.



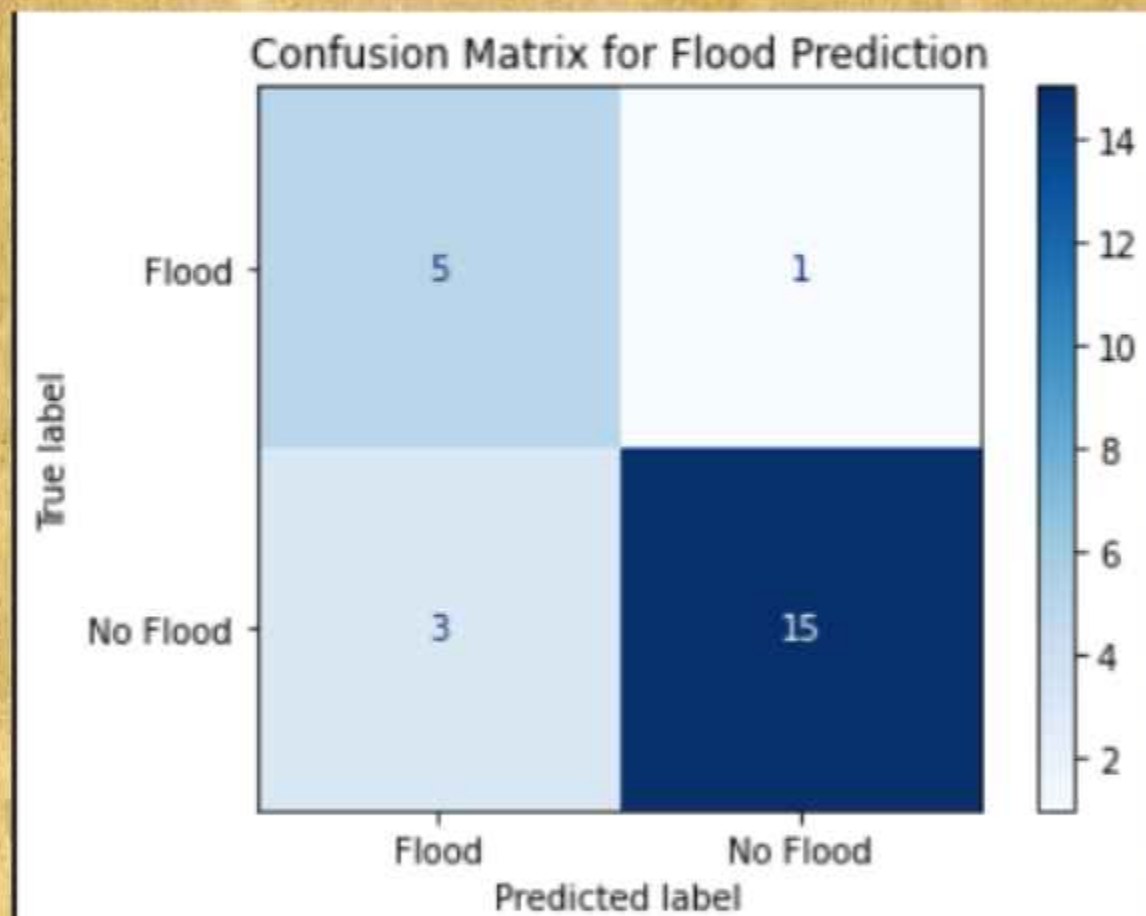
Predicting potential flood risk

Result and Analysis



This is the monthly rainfall data

Result and Analysis



True Positives (TP): 15
True Negatives (TN): 5
False Positives (FP): 1
False Negatives (FN): 3

Here we can see that our model had less false positive with the accuracy score 83%

Challenges & Future Development

Two green leaves are positioned on the right side of the slide, partially overlapping the title banner and the background paper.

- Challenges faced:
 - Inadequate dataset quality
 - Limited computational resources
- Future development ideas:
 - Create a comprehensive dashboard for each country
 - Implement an alert system
 - Extend detection capabilities to monitor other types of disasters

Thank you!

