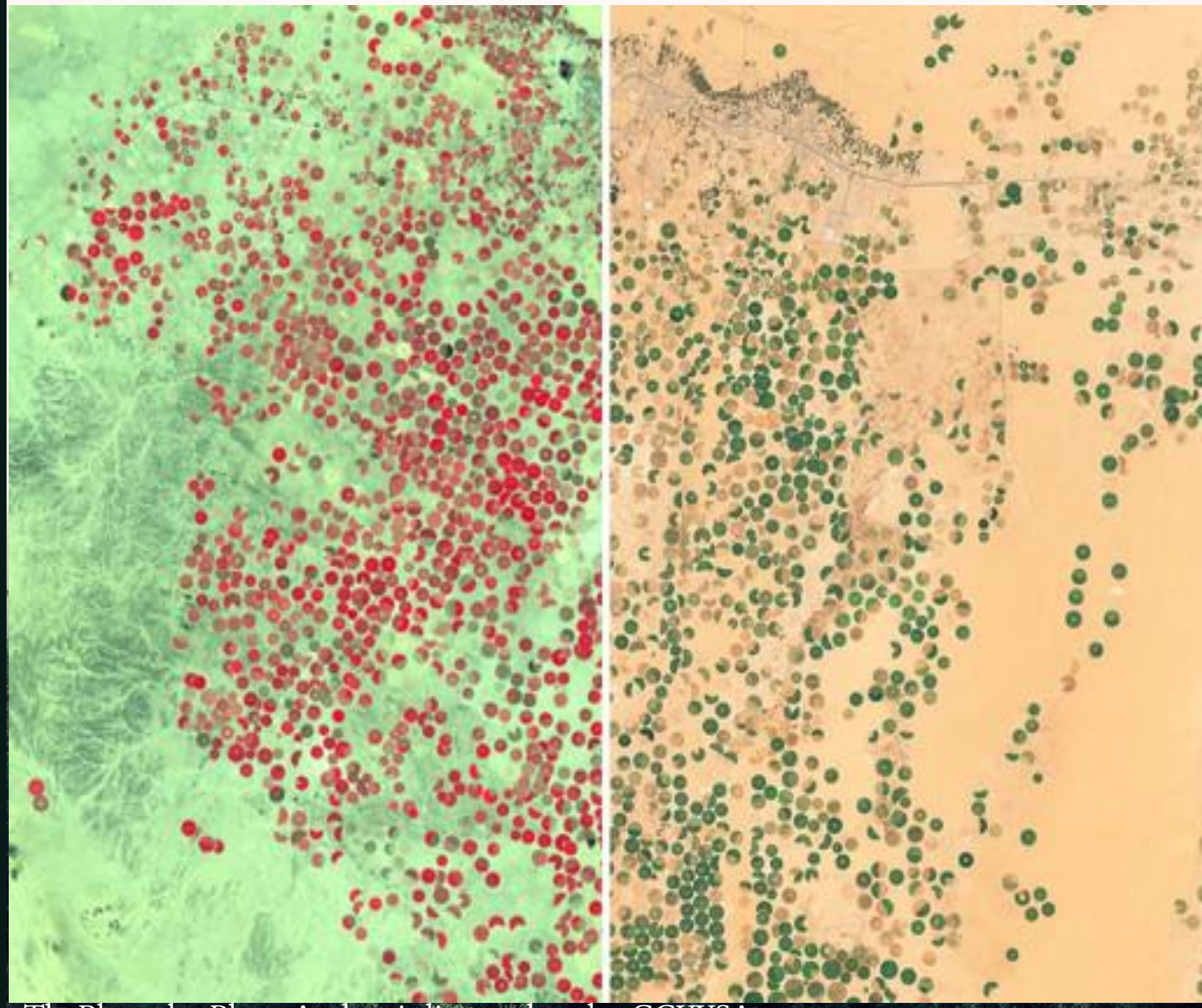
Cropland Mapping For Cropland Classification

USING SENTINEL SATELLITE DATA AND MACHINE LEARNING

13/08/2025



Problem Statement

- Current cropland maps in arid/semi-arid regions are often inaccurate.
- High uncertainty limits their usefulness for policy and planning.
- Cropland areas can be visually similar to pasture and steppe land, making classification challenging.
- Lack of reliable, up-to-date maps hinders food security planning and land management.

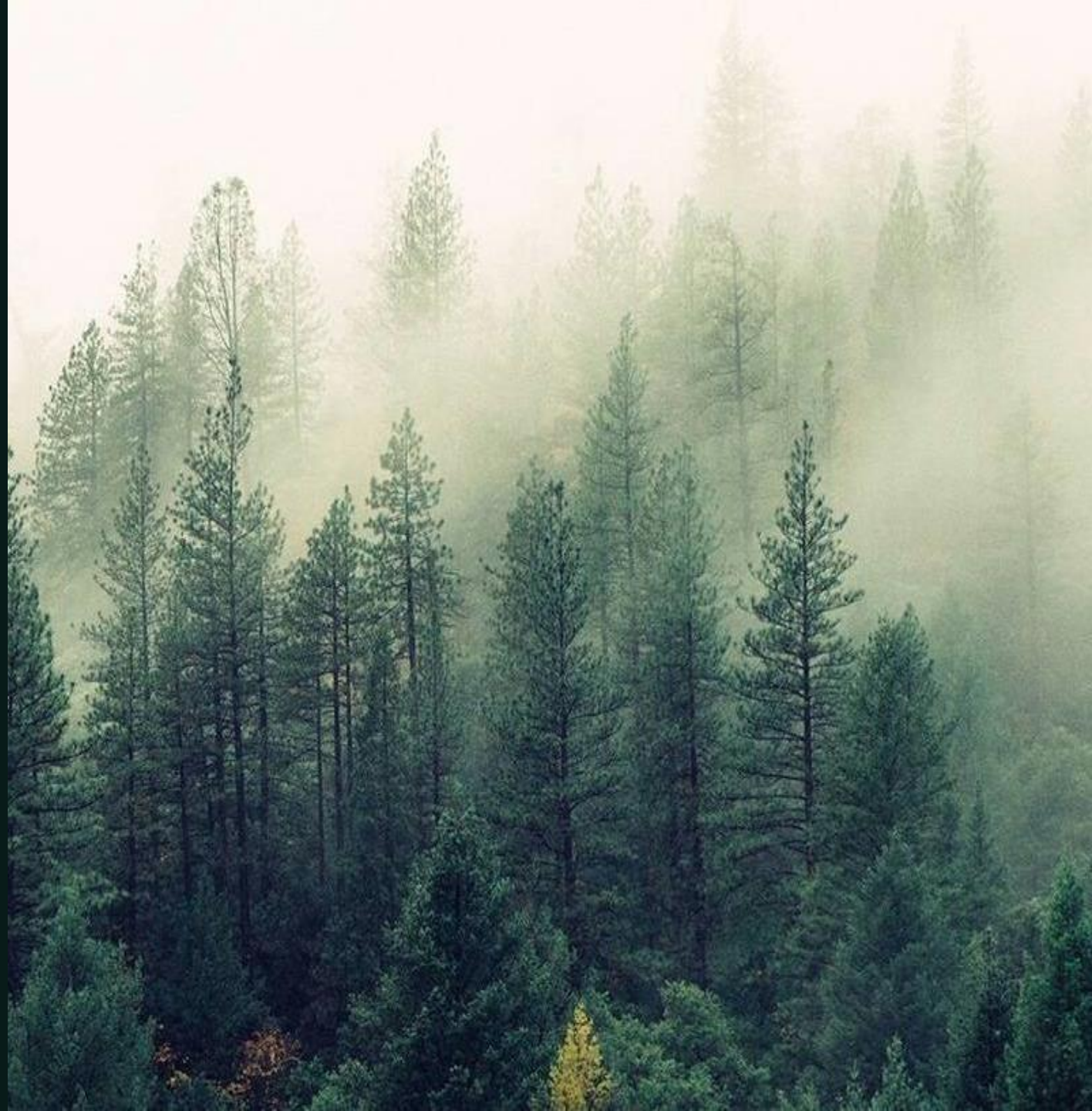
Objectives

- Accurately identify cropland in arid and semi-arid regions.
- Use satellite imagery and geospatial data for classification.
- Develop an automated model for cropland detection at pixel/region level.



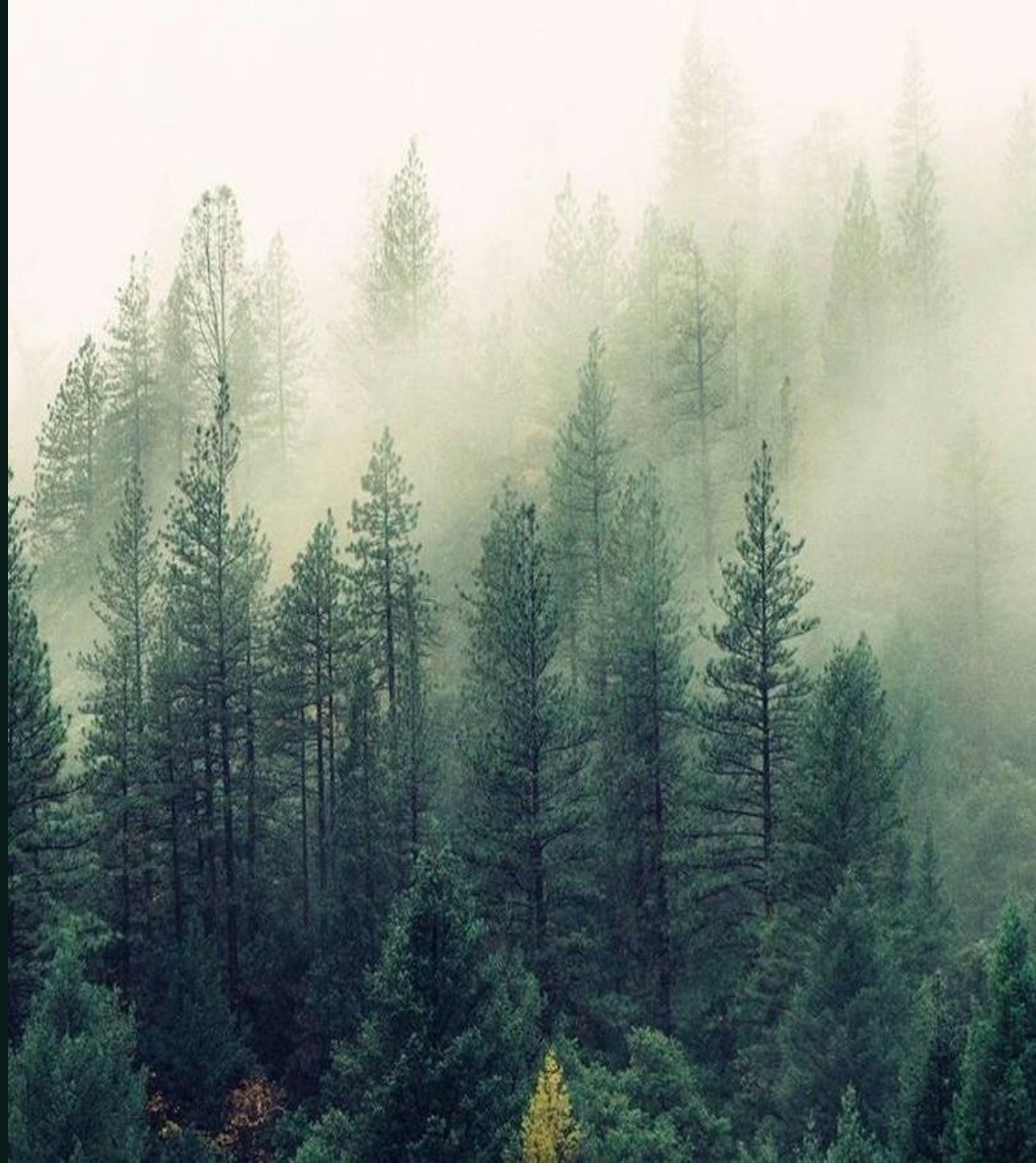

Business Understanding

- Links to food security, environmental monitoring and climate resilience.
- Climate change is expanding dry lands.
- Need for data-driven agricultural monitoring tools.
- Combine AI technical interest with real-world impact.



Data Understanding

- Multi-temporal Sentinel-1 (SAR) and Sentinel-2 (optical) imagery.
- Labelled training data for cropland classification.
- Sentinel-1: Radar reflectance data.
- Sentinel-2 : Optical reflectance data.
- Geographic focus : Fergana and Orenburg regions.



Data Preprocessing

- Removed Null values and duplicates
- One-hot encoding
- Applied tokenization.
- Dealt with class imbalance

Modeling

We implemented multiple classification models:

- Random Forest.
- XGBoost.
- Neural networks.

Results Comparison

Model	Accuracy	F1 Score	Precision
Random Forest	64.24	59.18	63.01
XGBoost	67.81	65.02	67.94
Neural Networks	92	92	91.0

Conclusion

- Machine learning models can effectively classify cropland in arid/semi-arid areas.
- Neural Network performed best among tested models.
- Integrating Sentinel-1 and Sentinel-2 imagery improves accuracy.
- Methodology can be adapted for other geographic regions.

Recommendations

- Expand dataset to cover more regions and seasons.
- Test deep learning models for potentially higher accuracy.
- Integrate additional environmental data (e.g., soil, climate).
- Collaborate with agricultural agencies for real-world validation.

Thank you!

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