TerraInsight: Inclusive Agricultural Planning and Sustainable Land Management

Team 3 - Darth

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PROBLEM STATEMENT

- Despite advancements in technology and agricultural practices, many regions still face significant challenges in optimizing land use and ensuring equitable access to agricultural opportunities.
- Factors such as soil type, moisture content, weather patterns, and erosion susceptibility play crucial roles in determining land suitability for different crops.
- However, obtaining accurate and up-to-date information about these factors can be difficult, especially in resource-constrained environments.
- Existing approaches to land assessment often overlook the diverse needs and socio-economic contexts of local communities, leading to inequitable distribution of agricultural resources and opportunities.

IDEATION

- TerraInsight seeks to address these challenges by developing a scalable and accessible solution for satellite-driven land assessment and crop suitability recommendation.
- It integrates satellite imagery data with advanced AI/ML algorithms to provide personalized recommendations tailored to the characteristics and needs of diverse agricultural landscapes.
- It aims to promote sustainable land management practices, enhance agricultural productivity, and foster inclusivity and equality across diverse societies.

METHODOLOGY

Data Collection and Preprocessing

Feature Extraction and Scaling

Model Development

Crop Suitability Assessment

User Interface and Accessibility

Data Collection and Preprocessing

Gather satellite imagery data from NASA's Sentinel satellites, which provide multispectral data capturing various wavelengths.

Collect ground truth data on soil type, moisture content, weather patterns, soil quality, erodability, and existing land use from relevant government agencies or field surveys.

Preprocess the satellite images and ground truth data to ensure compatibility and remove noise or inconsistencies.

Feature Extraction and Scaling

Extract features from satellite imagery such as vegetation indices, land surface temperature, and spectral signatures.

Incorporate auxiliary data like weather forecasts, soil databases, and historical crop yield data for comprehensive analysis.

Select relevant features based on their correlation with crop suitability and other land characteristics.

Model Development

Utilize machine learning algorithms such as Support Vector Machines or Convolutional Neural Networks to build predictive models.

Train the model using the extracted features and ground truth data to predict crop suitability.

Implement algorithms for unsupervised clustering to identify distinct land types and their characteristics.

Crop Suitability Assessment

Develop algorithms to analyze soil type, moisture content, weather patterns, and other factors to determine the suitability of land for different crops.

Consider factors like water availability, irrigation infrastructure, and market demand for crops in the region.

User Interface and Accessibility

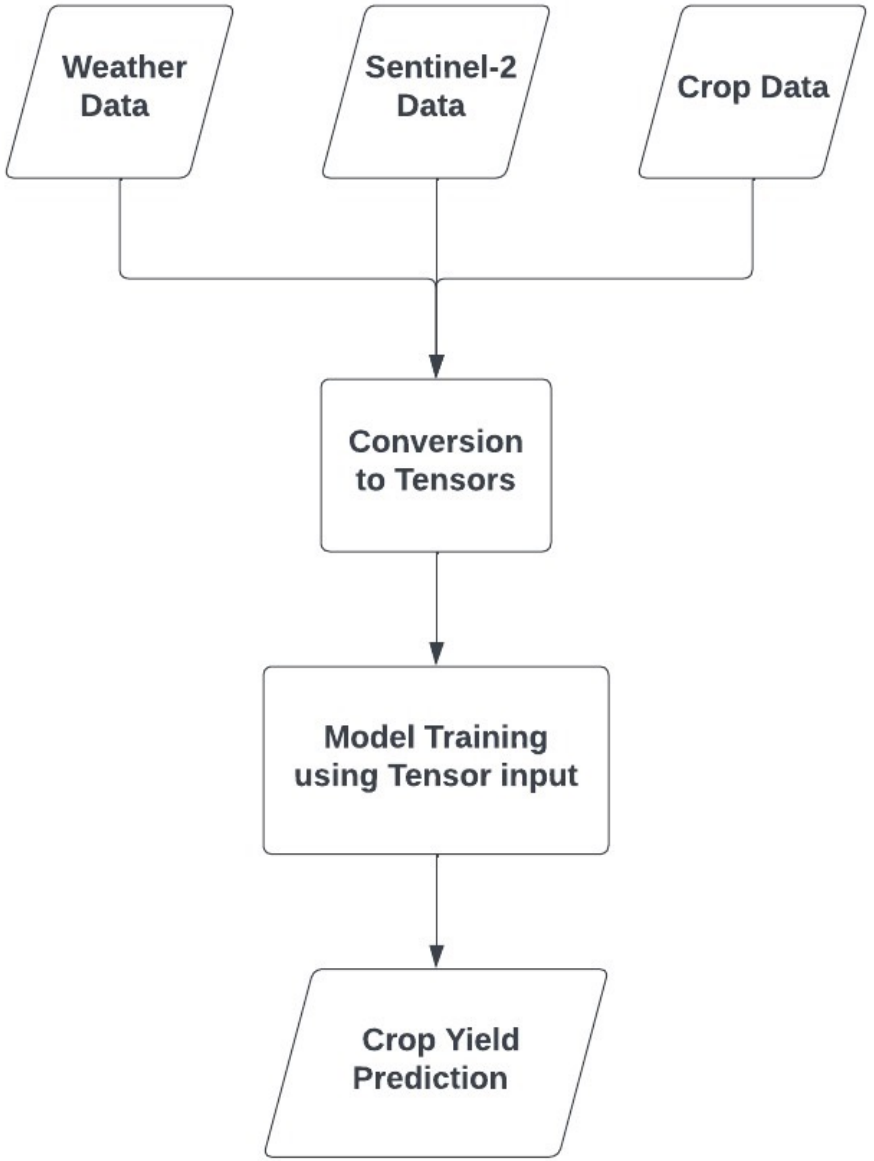
Develop an interactive dashboard to present the findings, allowing users to explore the suitability maps.

Provide interactive maps, charts, and decision-support tools to assist users in understanding the recommendations and making informed decisions.

DATA SOURCE

- **Sentinel 2 satellite data** - HDF5 format
- **Weather Research and Forecasting Model (WRF)** – HRRR (High Resolution Rapid Refresh model)
- **USDA Crop Dataset** - Annual raster, geo-referenced, crop-specific land cover data layer produced using satellite imagery and extensive agricultural ground reference data

ACTION PLAN


Weather Data
Sentinel-2 Data
Crop Data
Conversion to Tensors
Model Training using Tensor input
Crop Yield Prediction

THANK YOU