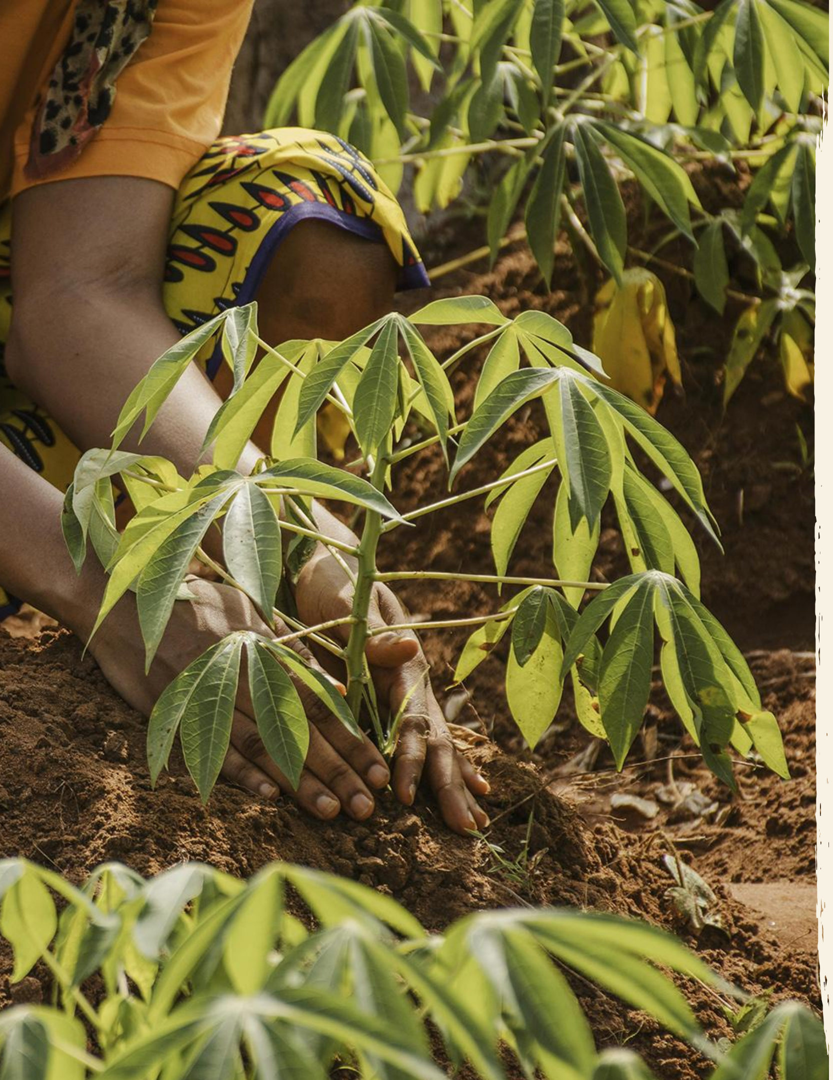


AgriSense

Where precision meets sustainability.

Pascual Eley | Josh Fram | Maria Manna
Diego McDonald | Cameron Yenche

August 15, 2024

Minimum Viable Product (MVP)

Yield Prediction

Helps farmers plan their harvest and market strategy

Crop Health Monitoring

Assess health more effectively, ID issues early & take corrective action to maximize yield

Intuitive Dashboard

Track farm performance metrics and understand the impact of resource allocation decisions

Stakeholder feedback to product

Yield Predictions

What will the expected yield for my strawberries be this season? How does that compare to previous seasons?

Crop Health

What areas of my farm are over or under-irrigated? Signs of stress or disease in certain areas?

Hesitant About New Tech

Some farmers might be skeptical about adopting new technology and changing traditional practices.

AgriSense App (Beta)

app.agrisense.info

1. Up-to-date yield prediction
2. At-a-glance target field landsat data
3. Simple interface (minimized options)
4. Explainers for each metric (EVI, Soil Moisture, Surface Temperature, Chlorophyll Content)

Public Datasets

Landsat (NASA) Satellite Imagery

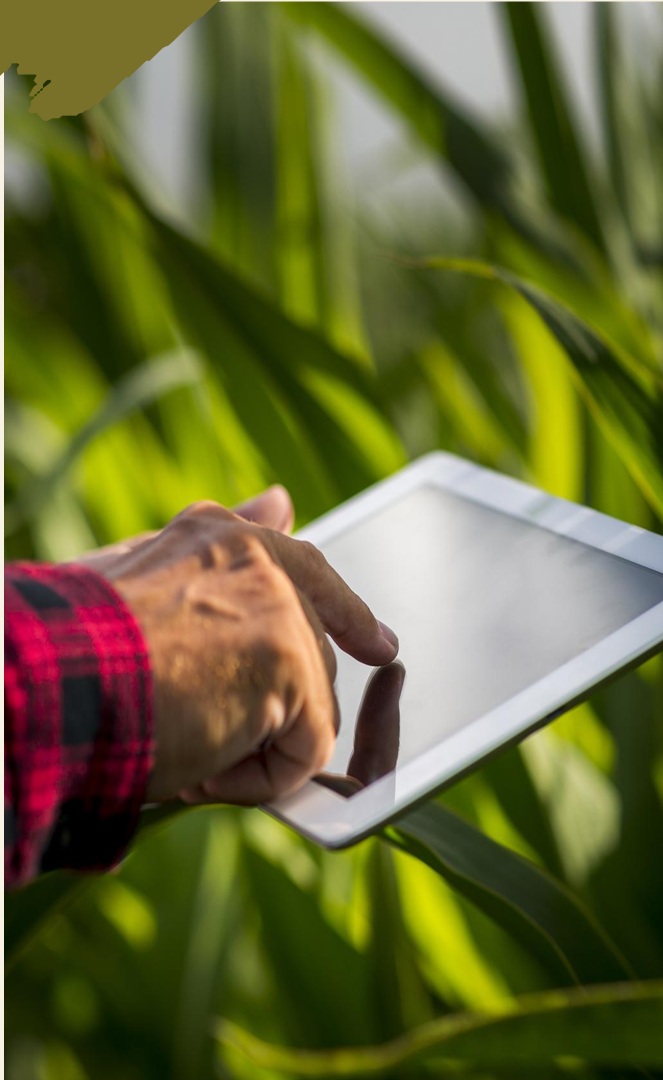
- High-resolution multi-spectral imagery for monitoring vegetation, land use, and environmental changes.

CropScape (GMU CSISS)

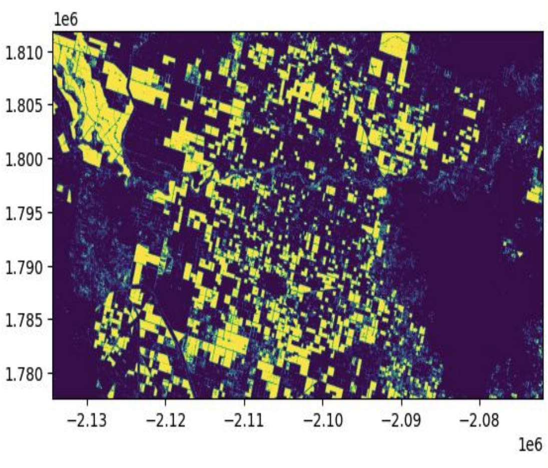
- Online tool for visualizing farmland by crop.

California Strawberry Commission (Daily Yield)

- Data on strawberry crop acreage, yields, and production estimates.

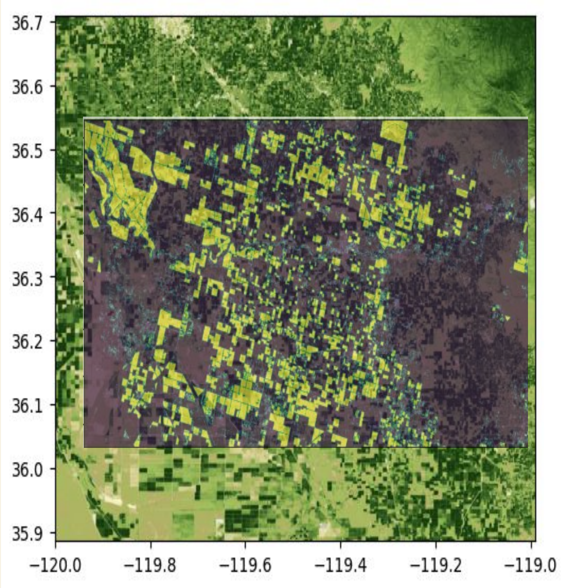


Data Analysis



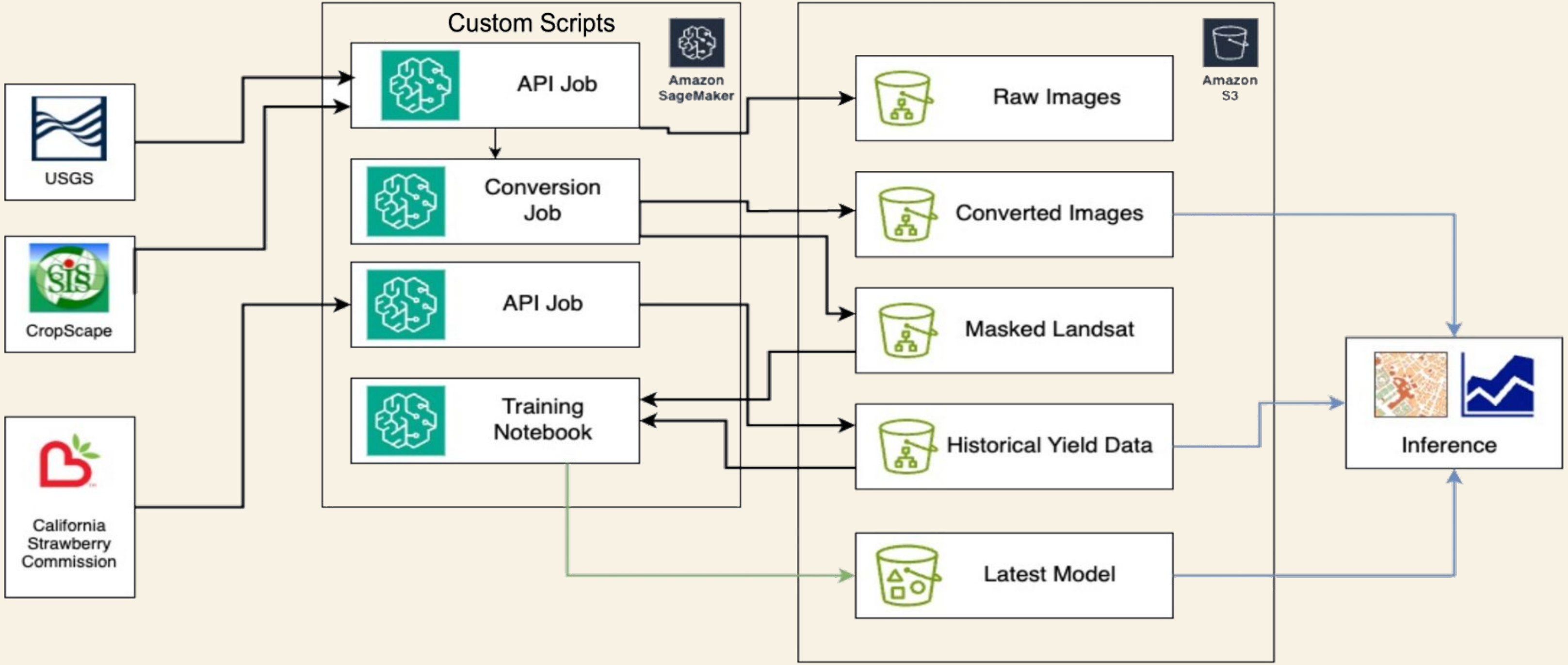
Identify strawberry farms using CropScape

Masks



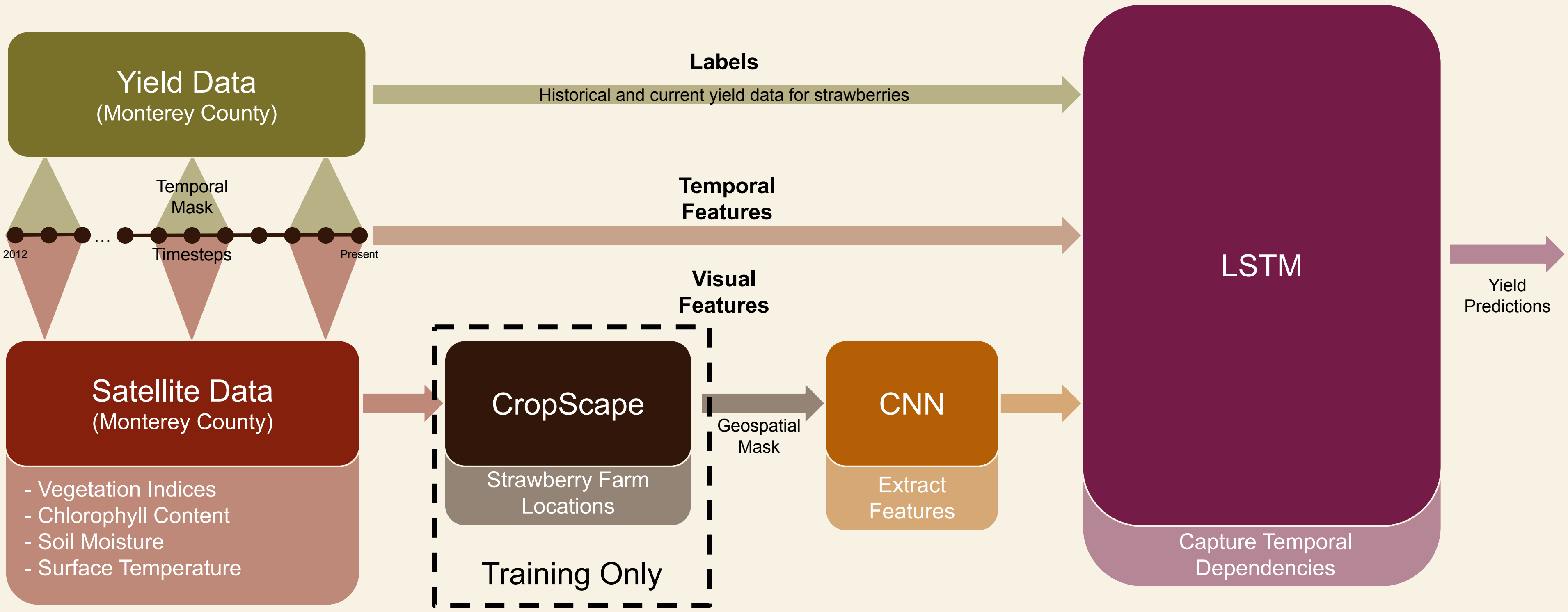
Mask satellite data for model input

Data Pipeline



- Custom scripts resample and **apply uniform spatial resolution** and coordinate system
- Amazon S3 for secure storage and easy access

Model Design - Training

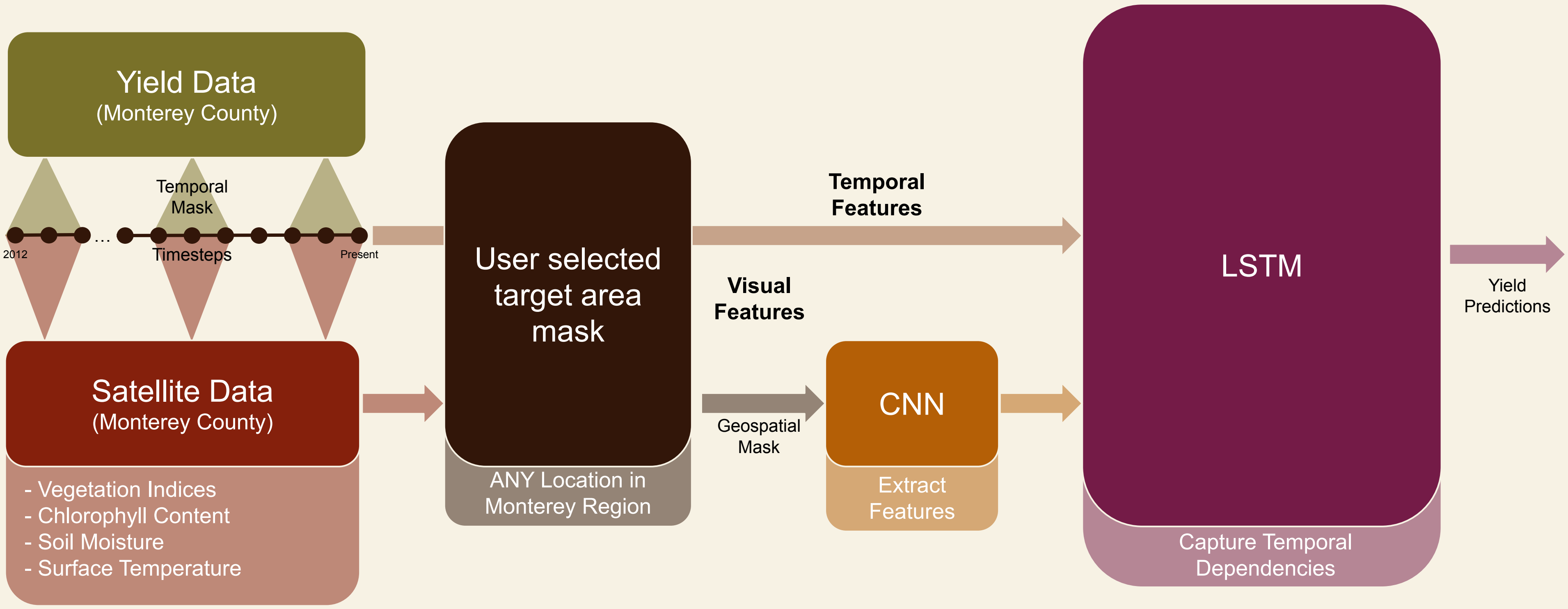


AgriSense

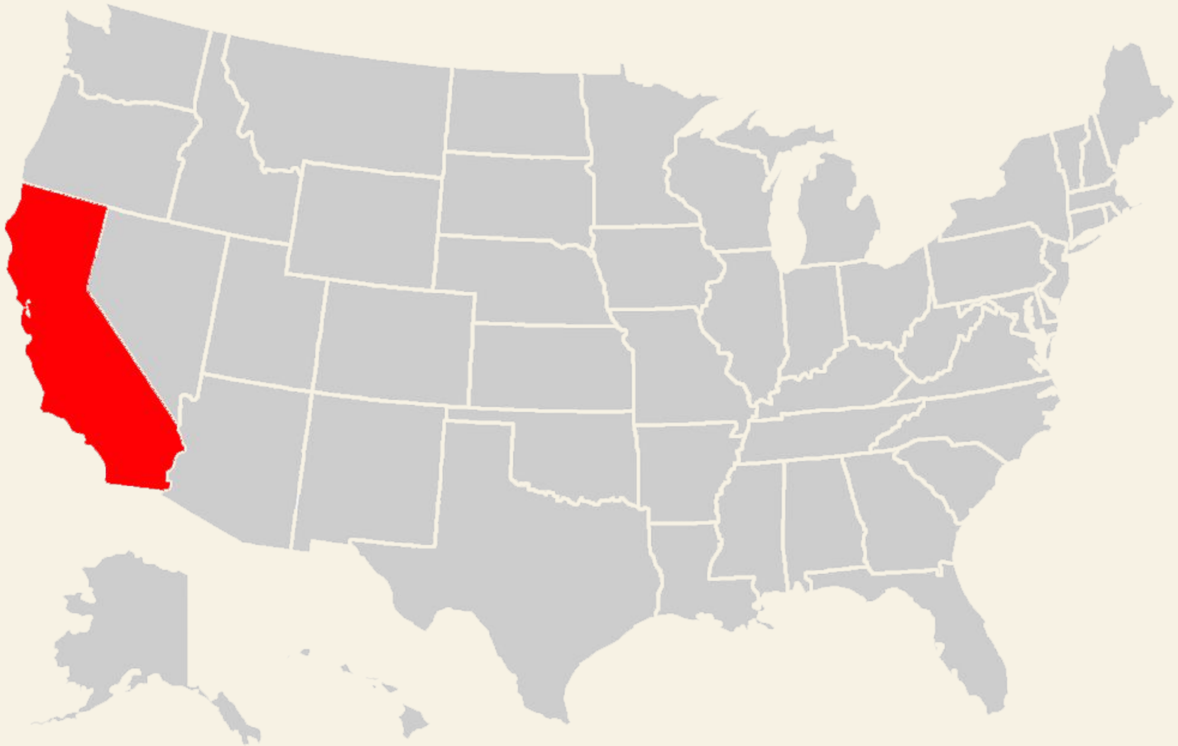
Make a selection below to view desired content:

Crop Health

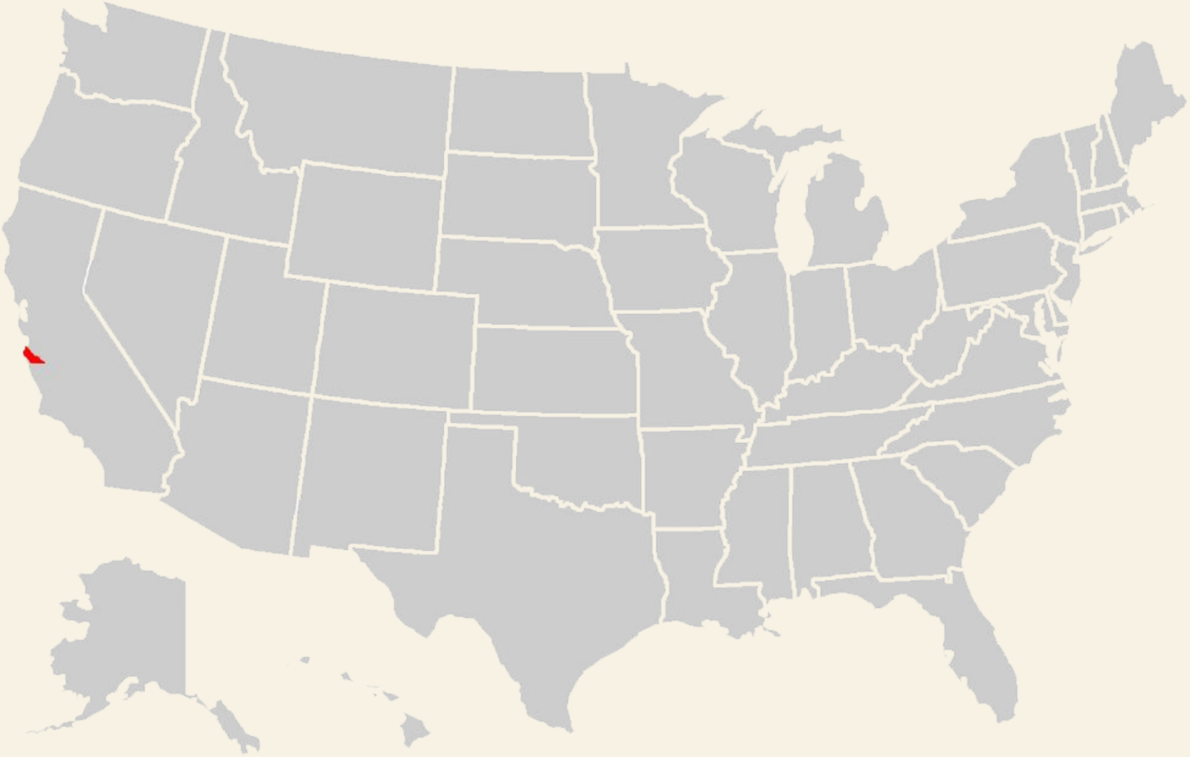
Model Design - Inference



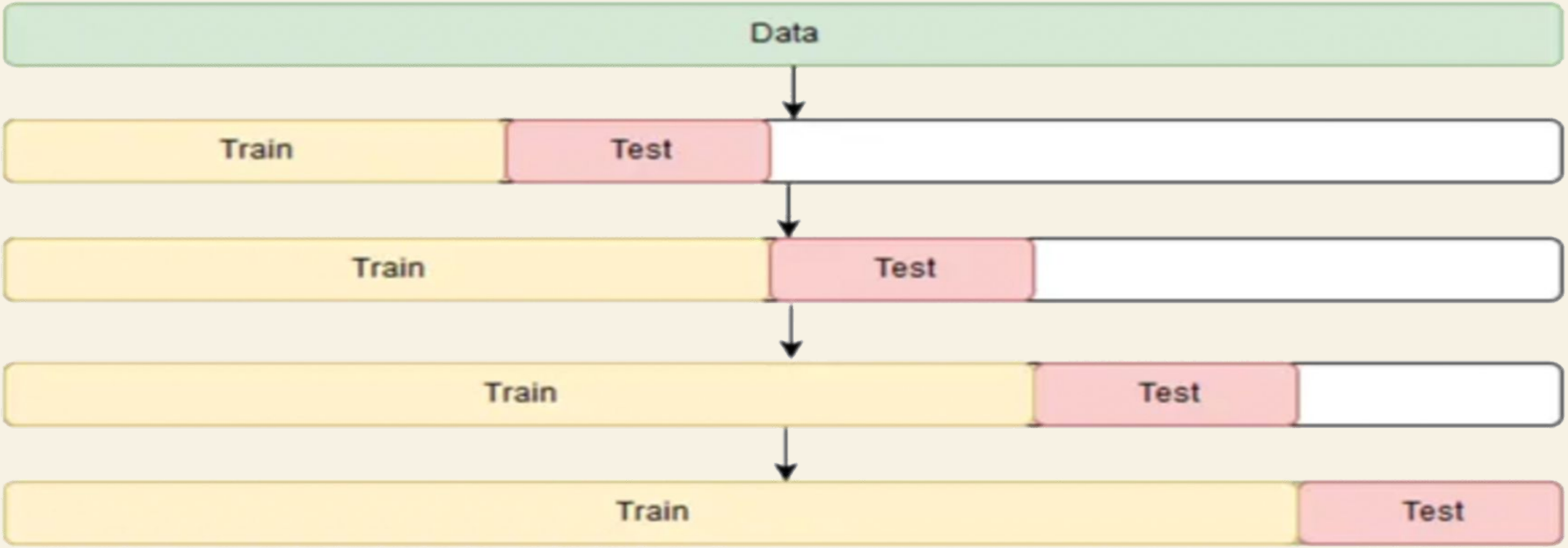
Current Limitations

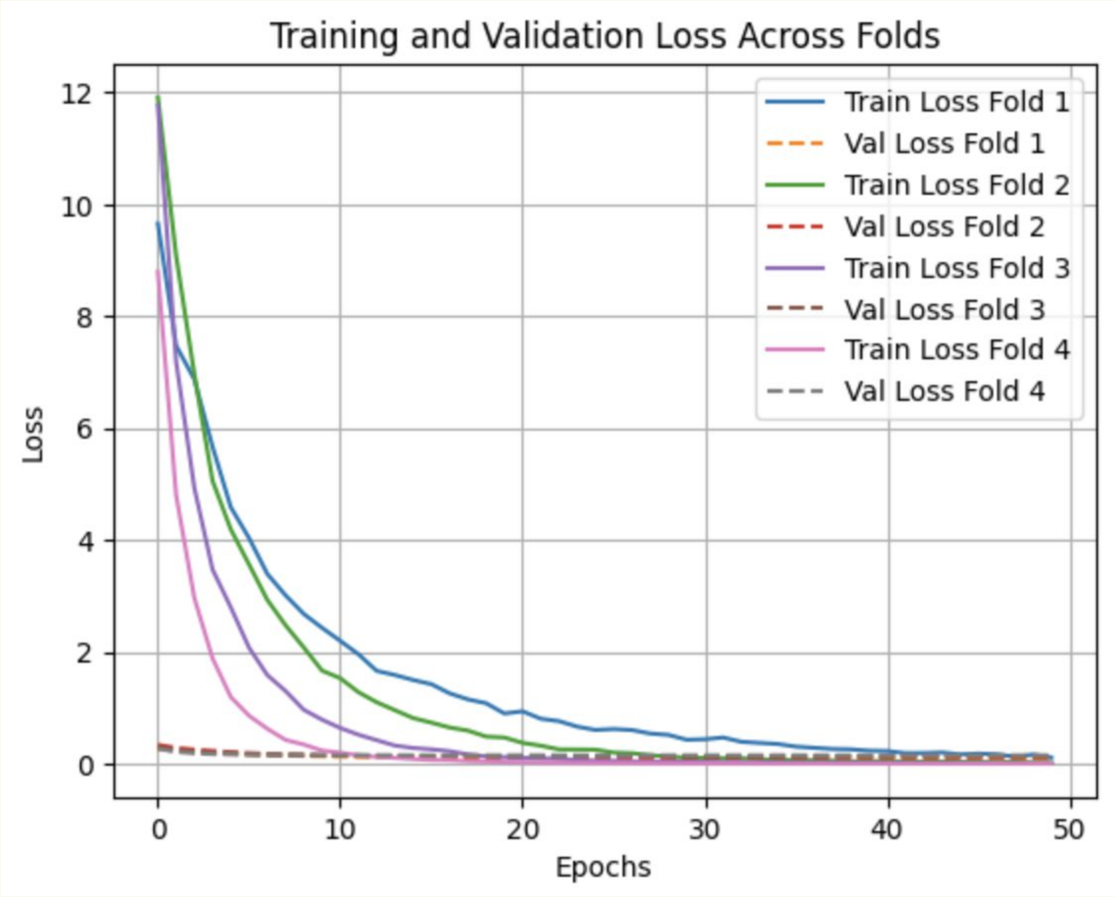


Current Limitations



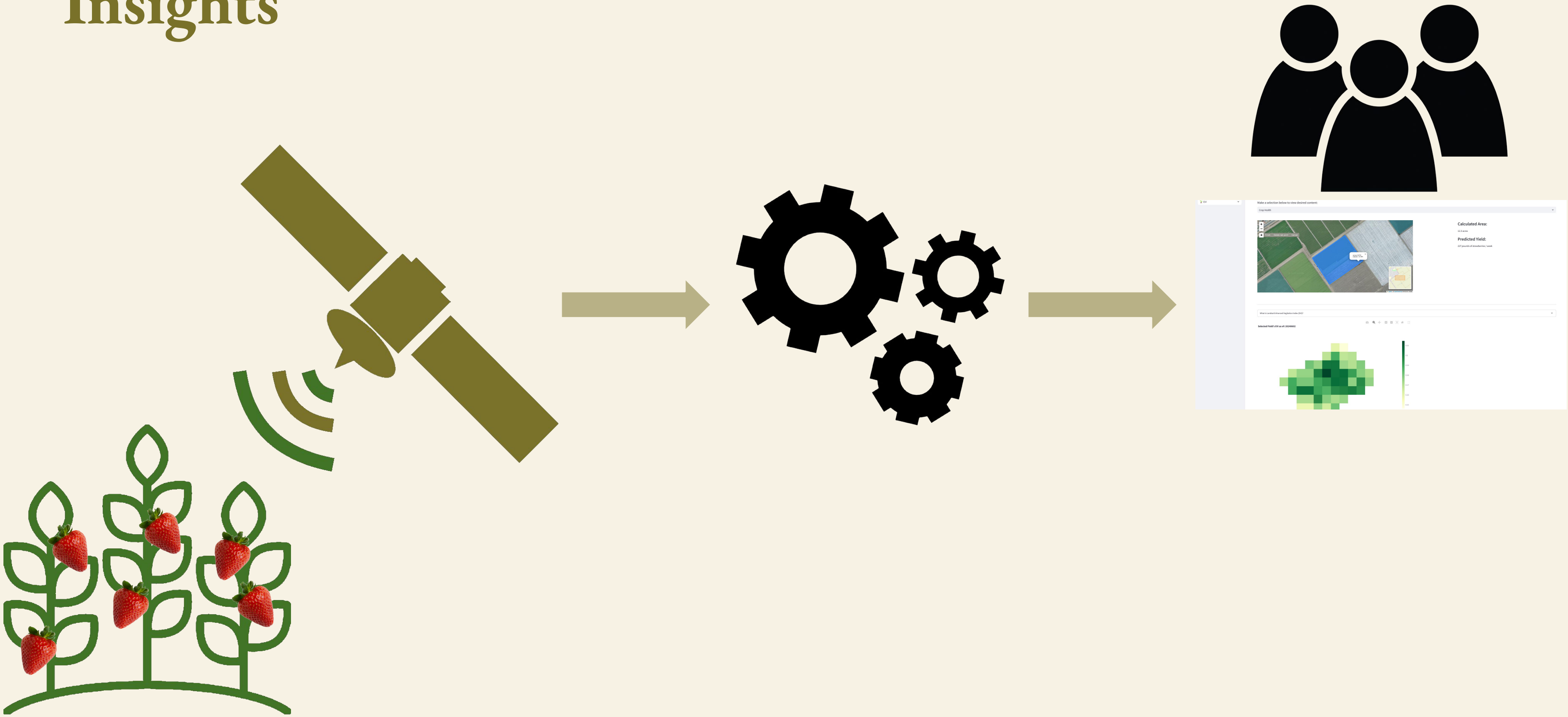
Time Series Cross Validation





# of Epochs	50
Avg MSE	0.12172
Avg RSME	0.34728
Avg MAE	0.25232
MedAE	0.25512

Insights



EVI
Make a selection below to view desired content:
Crop Health
Finish
Delete last point
Cancel
Calculated Area:
12.3 acres
Predicted Yield:
227 pounds of strawberries / week
What is Landsat Enhanced Vegitation Index (EVI)?
Selected Field's EVI as of: 20240602

Technical Challenges

1. Pixel level precision
2. Data age
3. Growing Storage

Future Work

01

Model Improvement

Train on additional data:

- More satellite bands
- Inputs from farmers (self-reported crop yields, sensor data)

02

Frontend Performance

Better results in less time:

- User profiles
- Saved farm areas (pre-mask landsat data)

03

Generalization

More crops and more locations!

- Almonds, grapes, tomatoes, lettuce
- Washington, Oregon

AgriSense

Where precision meets sustainability.

We empower farmers with tech-driven solutions.

We contribute to the economic viability & sustainability of farming.

We support the long-term health of the environment.

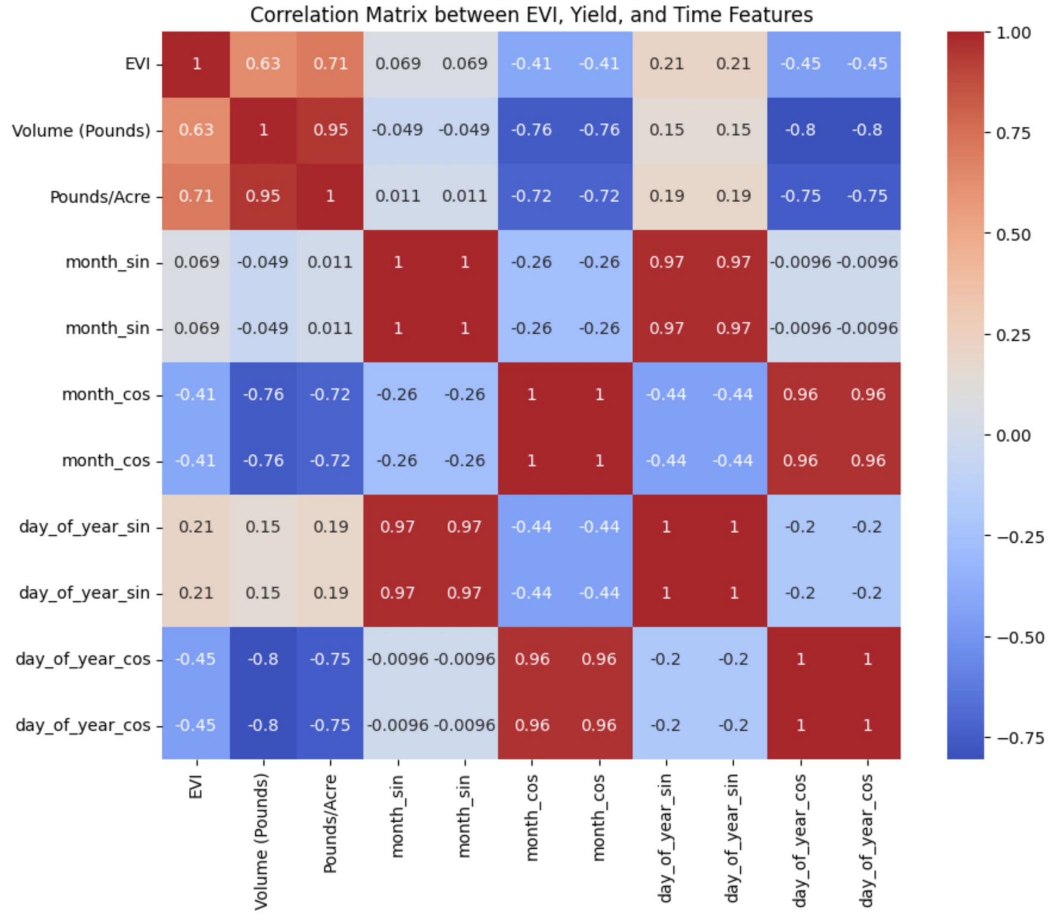
AgriSense

Appendix

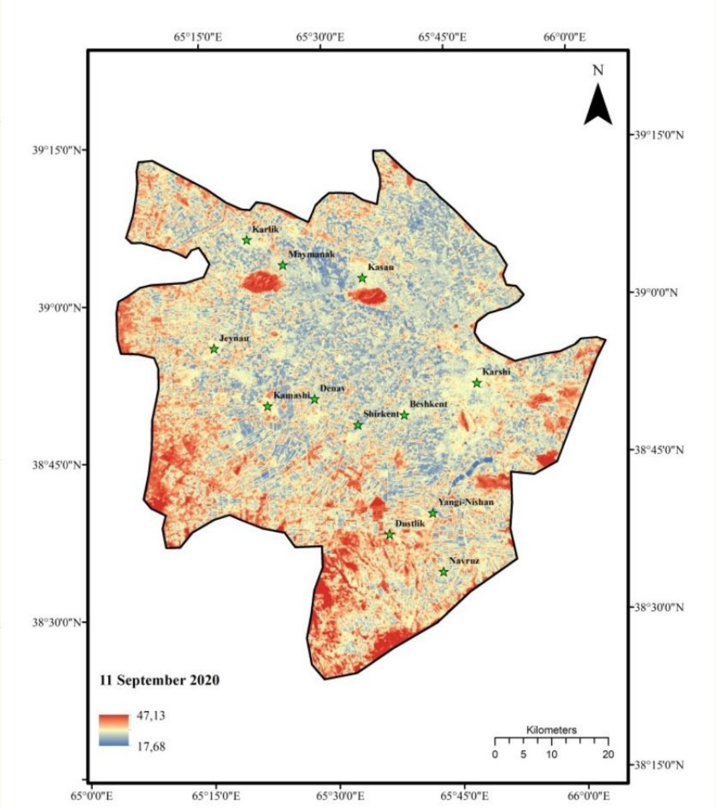
1. Correlation Matrix between EVI, Yield, and Time Features
2. Surface Temperature & Soil Moisture Plots
3. Limitations of Aggregated Yield Data
4. Ethical and Data Privacy Considerations
5. Market Research
6. Sources

EDA Correlation Matrix

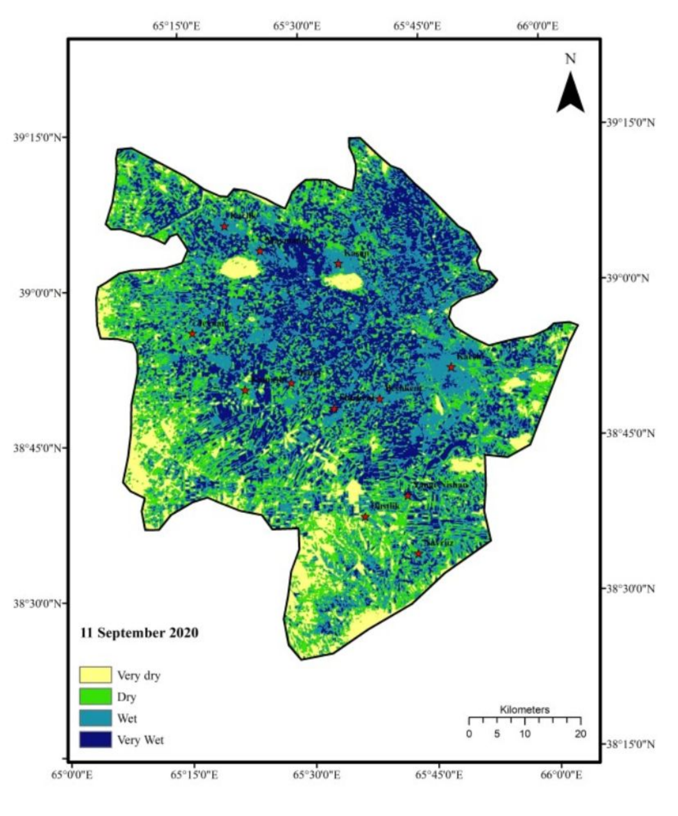
- **Pounds/Acre & EVI:** 0.71
- **Volume & EVI:** 0.63
- **Pounds/Acre & Month_cos:** -0.76
- **Volume & Month_cos:** -0.72



Surface Temperature & Soil Moisture



d) September 11, 2020



d) September 11, 2020

Limited by Aggregated Yield Data

What

- R^2 Value differs from metrics.
    - Cannot account for detailed variance and outliers

Why

- Yield data was aggregated on a county-level
    - No farm-level data for model training
- Smooths out the variance expected at the farm level

The Fix

- Higher granularity, farm-level, yield data is a vital future improvement and next step for the project

# of Epochs	50
Avg MSE	0.12172
Avg RSME	0.34728
Avg MAE	0.25232
MedAE	0.25512
R^2 Value	-1.0912

Ethical and Data Privacy Considerations

Environmental Impact

There is a risk that data-driven farming practices could lead to unintended ecological consequences.

Data Ownership & Confidentiality

Farmers should retain ownership of their data and have control over how it is shared and used, especially due to market competition

Impact on Employment

Automation and optimization may reduce the need for manual labor, impacting farm workers.

Biases in ML Models

ML models may inherit biases from training data, leading to skewed recommendations that might not be universally applicable.

Fair Access

While our product will cater towards medium and large farms, we want to make sure our technology is accessible to farmers who don’t have substantial financial resources

Market Research

OneSoil	Planet Labs	Farmers Edge
Satellite Monitoring	Satellite Monitoring & Imagery	Satellite Monitoring
NDVI Index	Planetary Variables	Data Portal (Farm-Specific)
Specify Individual Fields	Historical Image Library	Soil Sampling
Weather Data		
Farmers, agri-food/retail	Agriculture, government & defense, forestry	Farmers, insurance, agri-food/fuel/retail

Company	FarmersEdge™	OneSoil	AgriSense
Satellite Imagery Data	✅	✅	✅
Weather Data	✅*	✅	✅
AI-Driven Modeling	❌	❌	✅
Optimization Insights	❌	❌	✅
Seeding & Fertilization Data	❌	✅	❌

* Only Available in Premium Tier

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