

Agricultural Monitoring with Fields of The World (FTW)

Tutorial for CCAI at NeurIPS 2025

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Tutorial



About FTW

- 🌳 Agricultural expansion and management contribute to deforestation, biodiversity loss, and greenhouse gas emissions
- 🌡️ Climate change threatens crop yields, food security, and rural livelihoods
- 🧑🌾 Accurate, updated data about field location and management is essential for building sustainable and resilient food systems
- 🌍 Field information is unavailable, outdated, or fragmented in most of the world

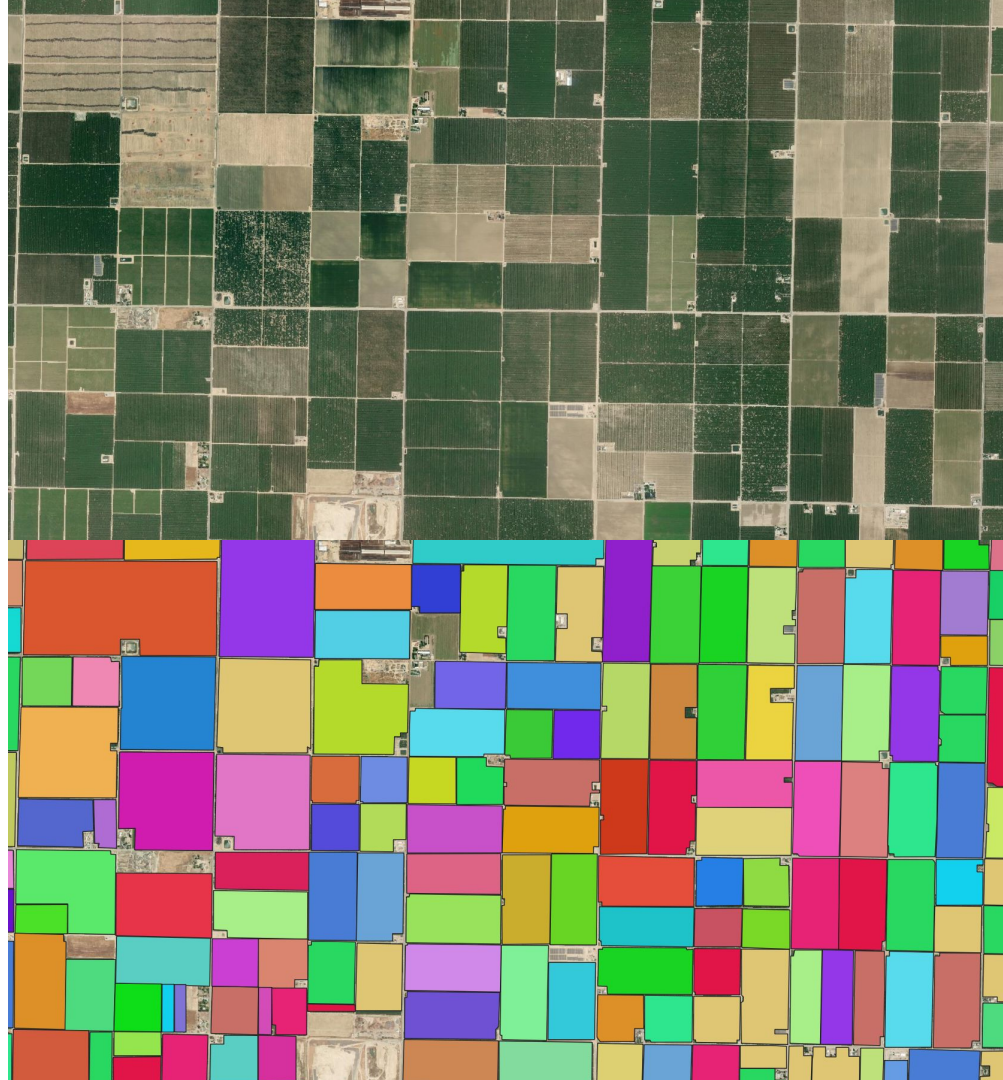
2020

2025

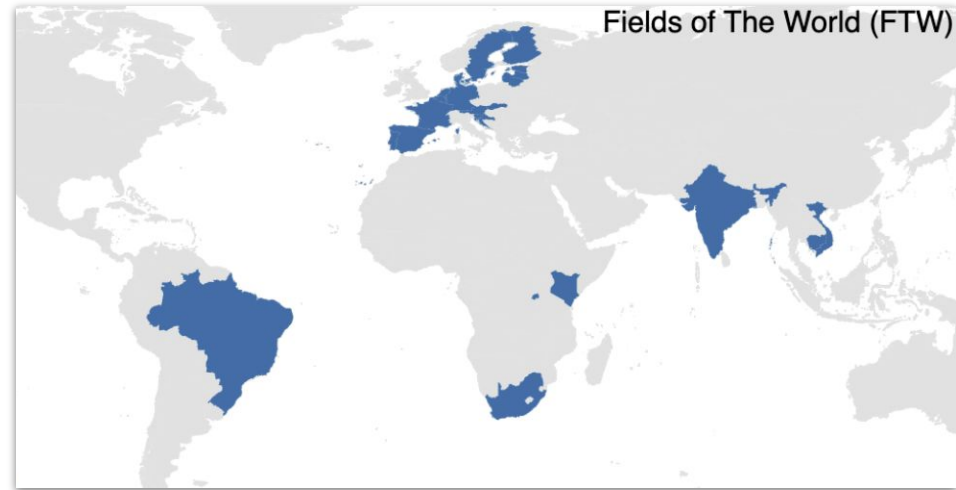
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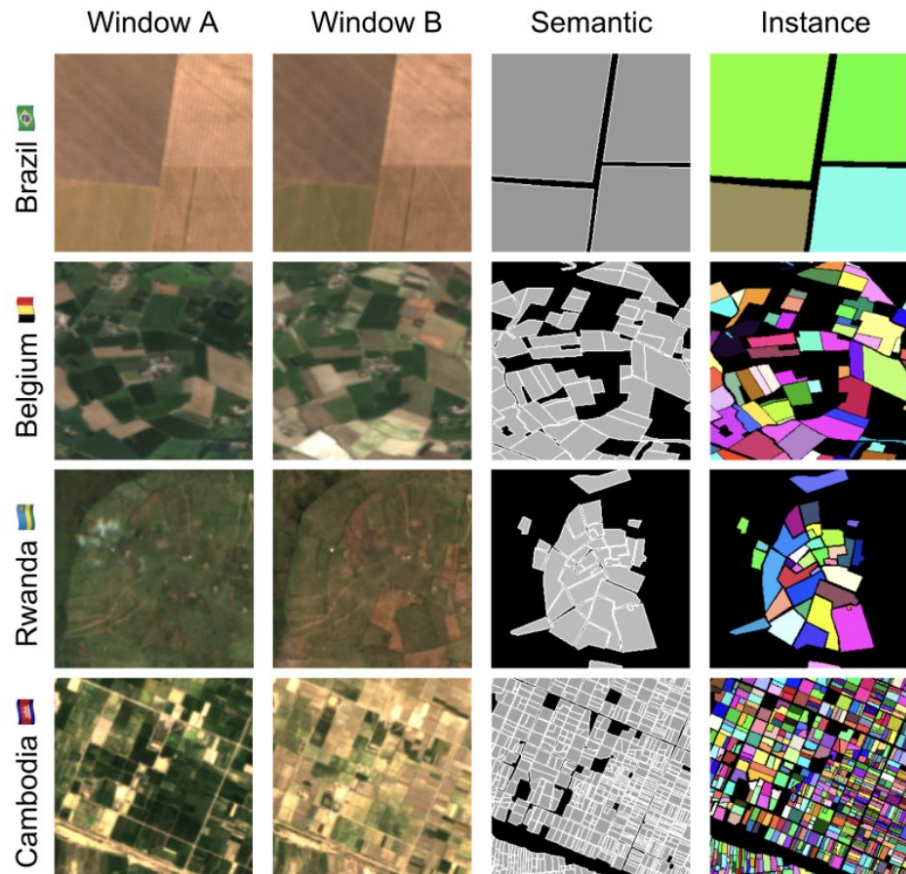
Countries covered by Fields of The World benchmark dataset. Ground-truth field boundary datasets do not exist for countries in gray.

Fields of The World (FTW)

- AI ecosystem for automatic field segmentation from satellite images
- Largest **ML benchmark dataset** of satellite imagery and field boundaries to date
 - 76,000 patches of 2-date Sentinel-2 satellite imagery, semantic and instance segmentation labels
- Covers **24 countries** on 4 continents
- Hosted **pretrained models** on FTW dataset
- **Command line interface (CLI)** for data processing, prediction, and post-processing



<https://fieldsofthe.world>



Training examples from Fields of The World benchmark dataset. Kerner et al. (2025), AAAI.



Tutorial objectives



Use FTW to **extract field boundaries** for a region and time of interest (ROI/TOI)



Use field boundaries for perform field-scale **crop type classification** (example in Iowa, USA)



Use field boundaries to identify **forest loss** in agricultural landscapes (example in Mato Grosso, Brazil)



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Steps for Generating Field Boundaries with FTW

Data Description

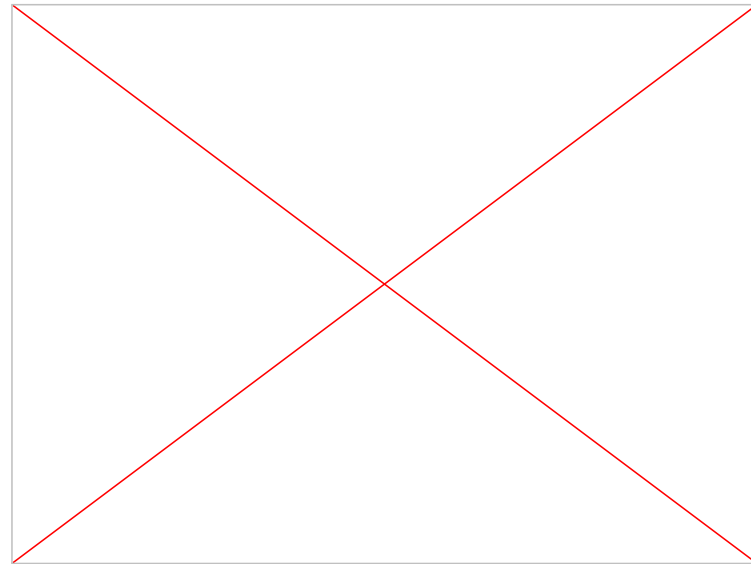
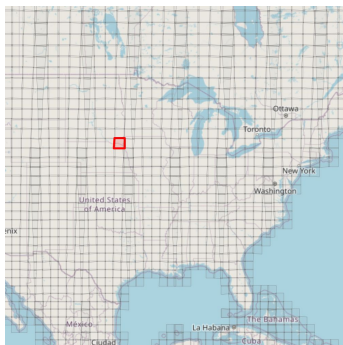
Data Download

 Specify your region of interest (ROI)

 Specify your time of interest (TOI)

 Get the start and end of season dates from crop calendar

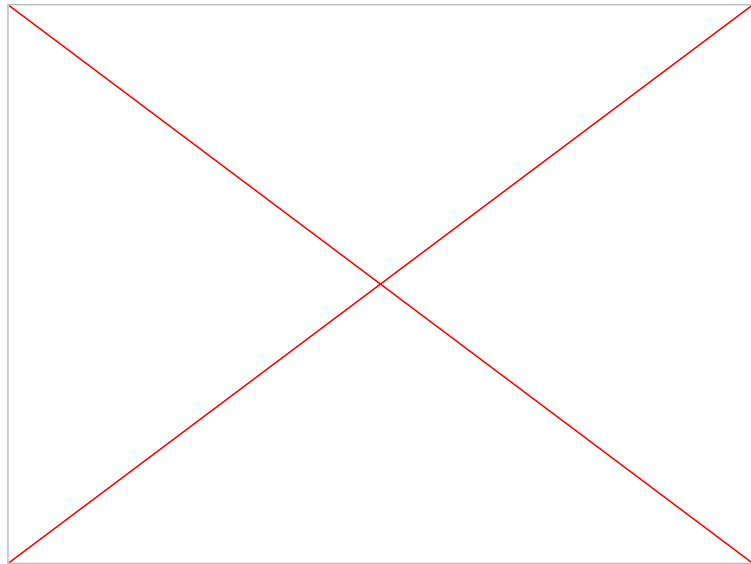
 Download Sentinel-2 images for Window A and Window B



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Steps for Generating Field Boundaries with FTW

-  Predict field boundaries
-  Filter predicted by land cover
-  Polygonize boundaries
-  Convenience function
-  Visualize the final field boundaries



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Use Case: Crop Type Classification

 Use case: crop type mapping with few labels

 Generate boundaries for crop type mapping use case

 Generate embeddings for each field

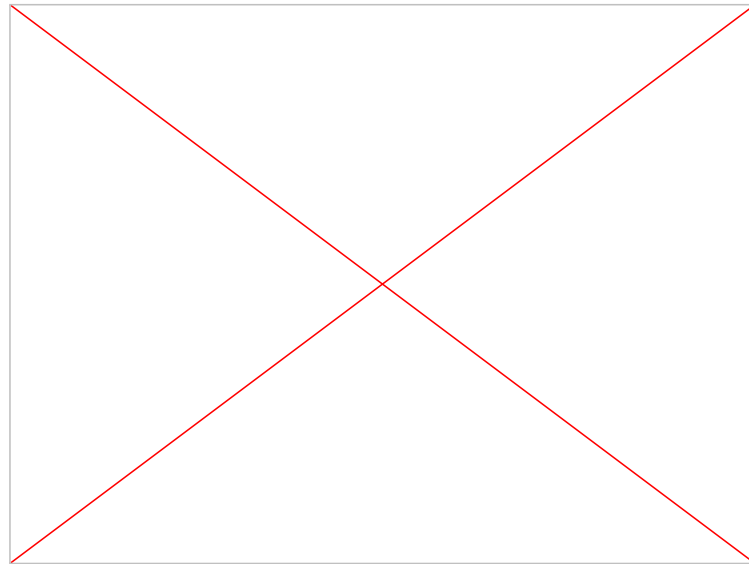
 MOSAICS

 Join with the USDA's Cropland Data Layer (CDL) data

 Predicting crop type with few labels

 Crop type mapping: Results & Discussion

 How does performance change with more labels?



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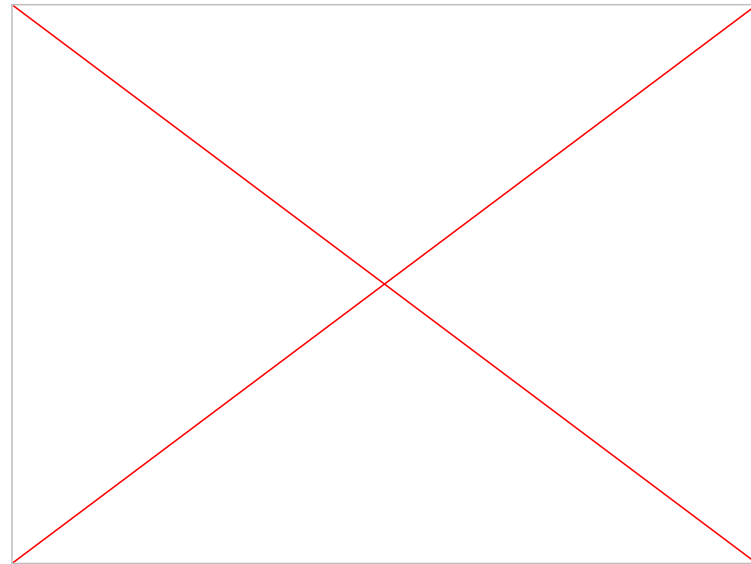
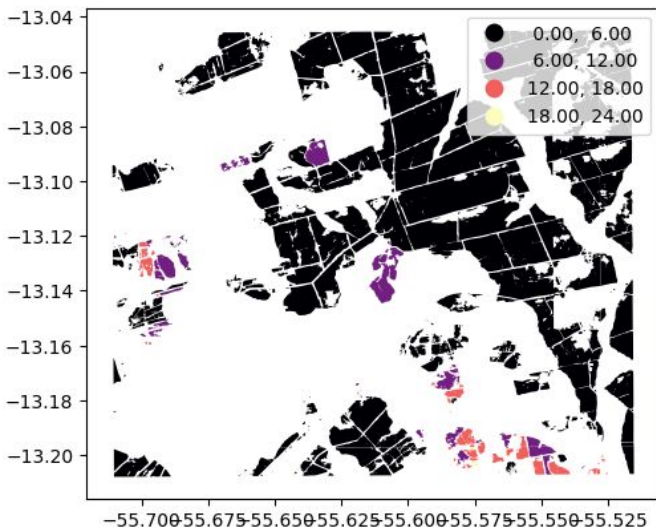
Use Case: Forest Loss Monitoring

🌳 Use case: monitoring forest loss

🟥 Do it yourself: Generate boundaries for forest loss use case

🌳 Join with Hansen Global Forest Change dataset

🌲 Monitoring Forest Loss: Results & Discussion



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Final Discussion & Takeaways

-  Field boundaries give a foundation for agricultural monitoring
 - Common data to link remote sensing data to agricultural monitoring tasks
 - Allow agricultural monitoring at the field (not pixel) scale
-  Forest loss monitoring
 - Forest change datasets can be intersected with field polygons to identify fields associated with recent deforestation
 - Related to supply chain verification and compliance with regulations like the EU Deforestation Regulation
-  Crop type mapping with few labels:
 - Even limited ground-truth labels can be leveraged for crop classification, but accuracy scales with more training data
 - Particularly relevant for data-scarce regions