SKY CROP

in cooperation with:

LISTENFIELD

Pain: Client Needs

What information do you need to start a rice or sugarcane mill in a new region?

Rice and Sugarcane Mill Owners

FIRST - Field segmentation data is key

- Which crops are now being grown in individual fields locally?

THEN - Use the field segmentation data to estimate:

- Mill crop input amounts (local rice/sugarcane)
- Amounts of fertilizer/pesticides to sell to rice and sugarcane farmers
- Size of mill to be built, equipment, and required investment

Pain: Current Hurdles

To identify crops in individual fields, mill owners use:

- Existing government land and crop databases
  - ✖ Not up-to-date
- Creating own new database
  - ✖ Take a lot of human resources, time, and money
  - ✖ Visiting fields on foot can be costly and unwelcome in a state of COVID

Solution: SKY CROP

Our SKY CROP app can identify the crop type (rice vs. sugarcane):

01	Remotely (satellite)
02	Using latest data
03	At a lower cost

Solution: Roadmap

01	Segment fields
02	**Identify crops that are being grown in real time**
03	Estimate production amounts of local fields
04	Estimate amounts of fertilizer and pesticides to be sold to farmers

Data collection

Data provided by LISTENFIELD

- Vietnam - Segmented rice field imagery
- Thailand - Segmented sugarcane field imagery

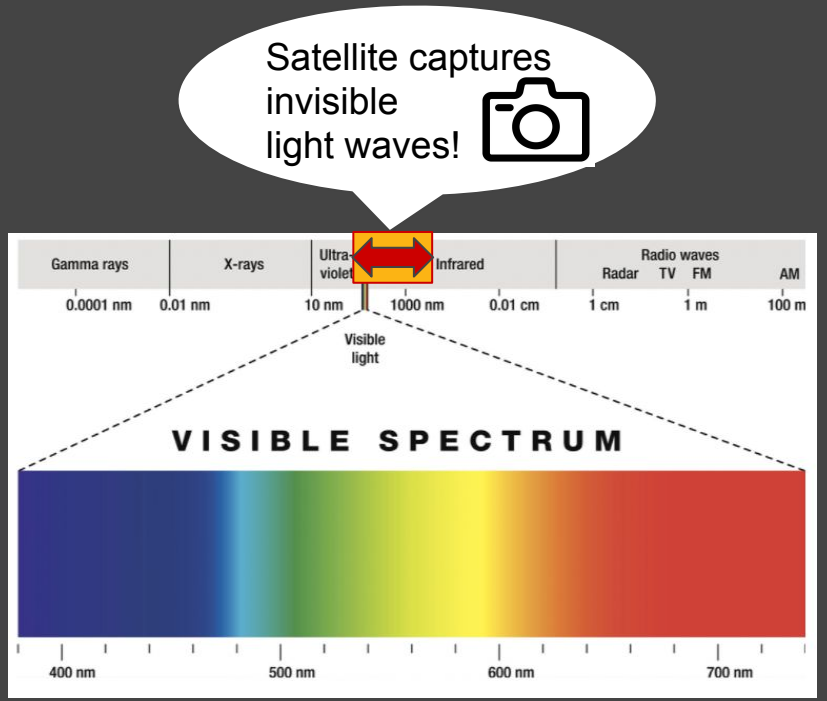
Humans cannot see the difference between rice/sugarcane fields with the naked-eye

Watching the Earth 24/7

Satellite Imagery: Band Data

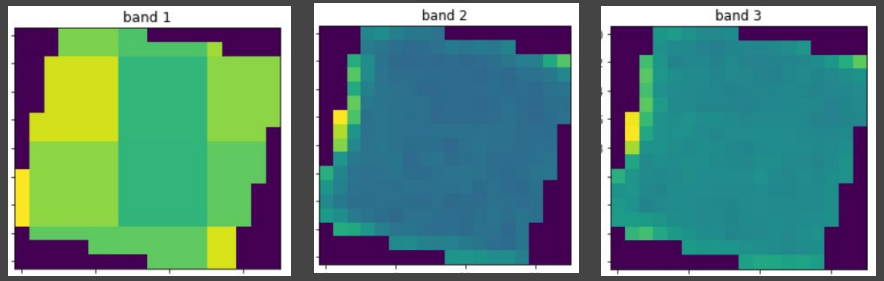
Sentinel-2 Satellite captures 13 spectral bands: visible (red, green, blue), NIR, red edge, SWIR, and atmospheric bands

Band data can be used to assess the state and change of vegetation, soil, and water cover over time



Data Sample

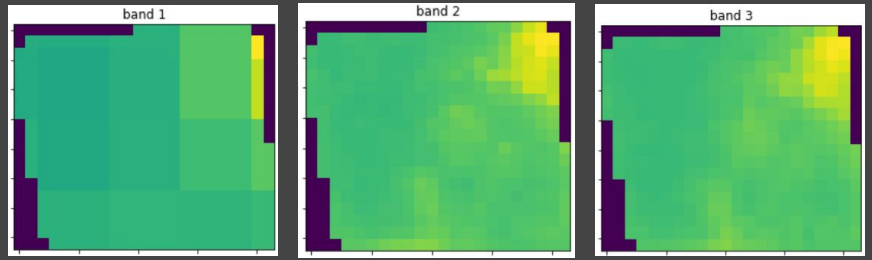
Rice field



Band 1: [0, 0, 819, 819, 0, …]
Band 2: [0, 0, 735, 824, 0, ...]
Band 3: [0, 0, 1032, 1138, 0, ...]

Band13: [0, 0, 642, 642, 0, ...]

Sugarcane field



Band 1: [684, 577, 577, 577, 577, …]
Band 2: [751, 496, 454, 401, 388, ...]
Band 3: [1106, 865, 697, 700, 724, ...]

Band13: [1586, 1521, 1521, 1401, 1401, ...]

Numeric information of each band was used to train our model

Band Combinations

False Color Index

(B7 + B6 + B4):

Useful for:

(1) Visualizing areas of dense vegetation

(2) Identifying vegetation types

Agriculture Index

(B11 + B8 + B2):

Useful for:

(1) Monitoring the health of crops

(2) Highlighting dense vegetation (dark green)

Green Normalized Difference Vegetation Index (GNDVI)

(B3 - B8) / (B3 + B8):

Sensitive to the variation of chlorophyll content in the crop.

Train Classification Model

START

GOAL

Baseline model

Logistic regression model

Add more features and data, try different algorithms

Train Model

Best model

KNN model

Accuracy: 95%

SKY CROP: http://skycrop.herokuapp.com/

Challenges

- Complex (unstructured) data
  - Satellite imagery data extraction, manipulation, and preprocessing
- Selecting important features
  - Which factors impact model scores?
  - Which feature is important?
- Selecting the best performing model
  - KNN, random forest, logistic regression, SVM, neural network, SGD
- Creating a simple user interface and easily input field data

What's Next?

- More classes (new crops - cassava, corn, wheat, etc.)
- New geographies (Southeast Asia, Indonesia, India)
- Estimate production yield
- Automate segmentation of individual fields
- Create simple, intuitive user interface for mill owners

Our Team

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In cooperation with LISTENFIELD


Thank you!