# Image Segmentation and Classification in ArcGIS Pro

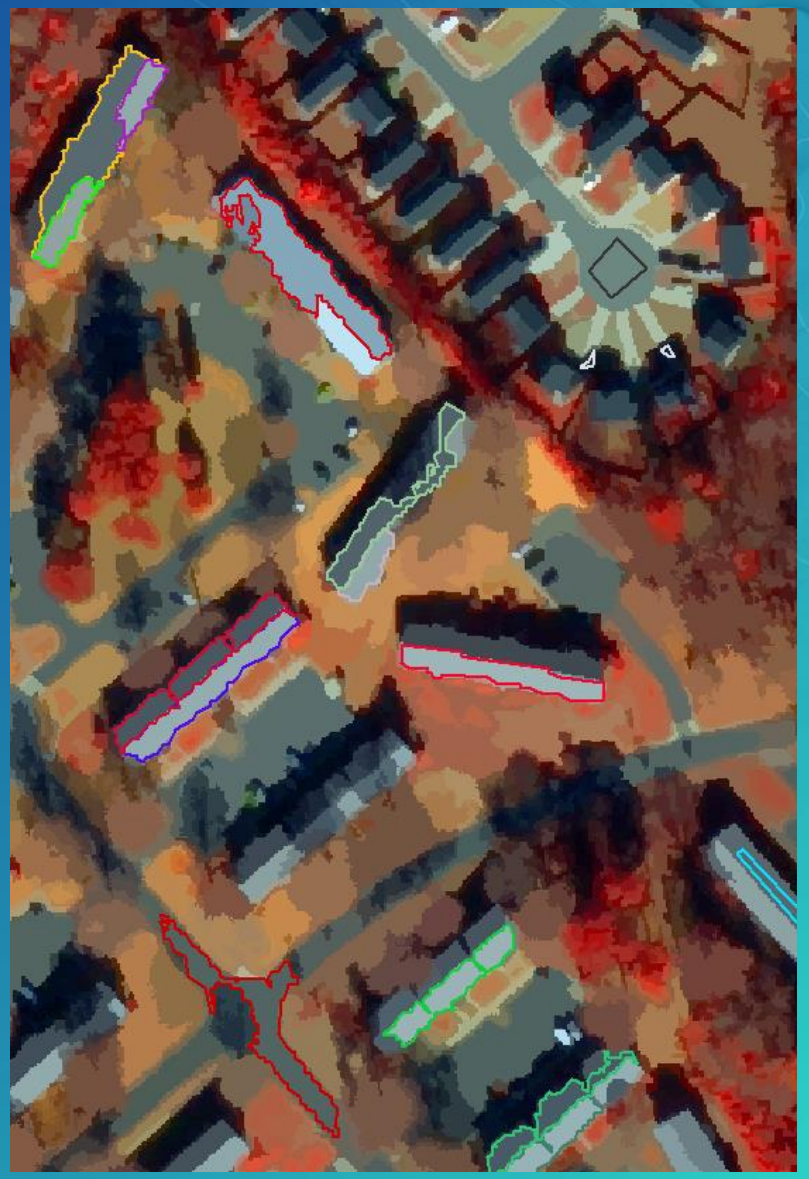
Hua Wei

Gerry Kinn

# Topics

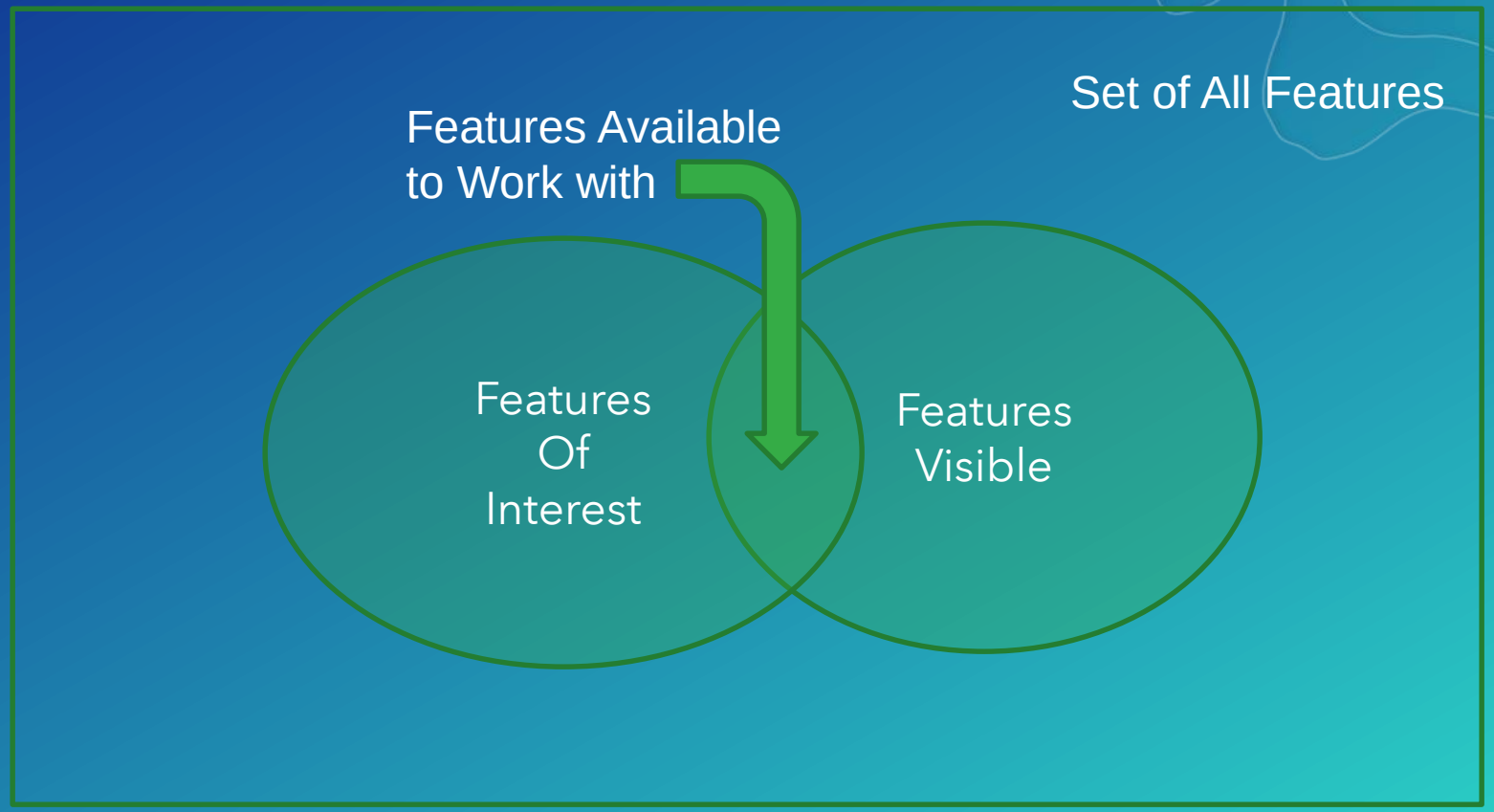
- Introductory remarks
  - We will work in Pro
  - Discussion on the overall process
  - Architecture
  - Image processing commentary
- Tools
  - Segmentation
  - Classification logic
- Workflows
- Closing remarks
  - QA/QC commentary
  - A brief look ahead

ArcGIS Pro



# Schema Considerations

The things we extract from imagery



# Choosing the correct schema

- The most important choice you can make is the optimal schema
- Existing schemas – Anderson, NLC, etc.
- You can create your own
  - Be aware of separable features
  - Understand semantic labels and their relationships
    - 1 → 1
    - many → 1
  - Consider collaborator needs
  - Keep it simple

| *Level I* | *Level II* |
|---|---|
| **1 Urban or Built-up Land** | |
| | 11 Residential |
| | 12 Commercial and Services |
| | 13 Industrial |
| | 14 Transportation, Communications, a |
| | 15 Industrial and Commercial Comple |
| | 16 Mixed Urban or Built-up Land |
| | 17 Other Urban or Built-up Land |
| **2 Agricultural Land** | |
| | 21 Cropland and Pasture |
| | 22 Orchards, Groves, Vineyards, Nurs |
| | 23 Confined Feeding Operations |
| | 24 Other Agricultural Land |
| **3 Rangeland** | |

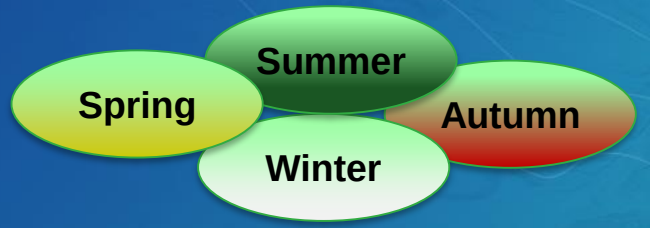
# The second most important choice is process design

Find the processing that enhances your desired features

- Machines learn best when the features are clearest
- Choose your extraction paradigm
  - Not all features are spectrally distinct
  - If your schema calls for objects, consider segmentation
  - If your features are set on a background, minimize the background
  - Consider if you want to extract a feature (or few) at a time or all at once
  - Consider image processing to mitigate lighting, maximize vegetation, etc
  - Can you use other GIS data, preprocessed or post?
- Build your input image stack
- Consider post extraction labeling and filtering

# Choose your data carefully

## Optimize your data if possible

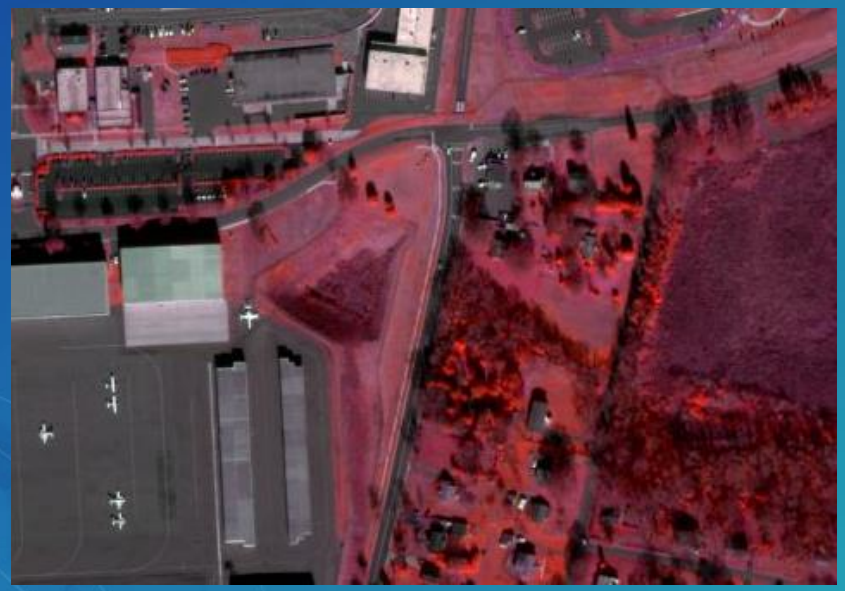


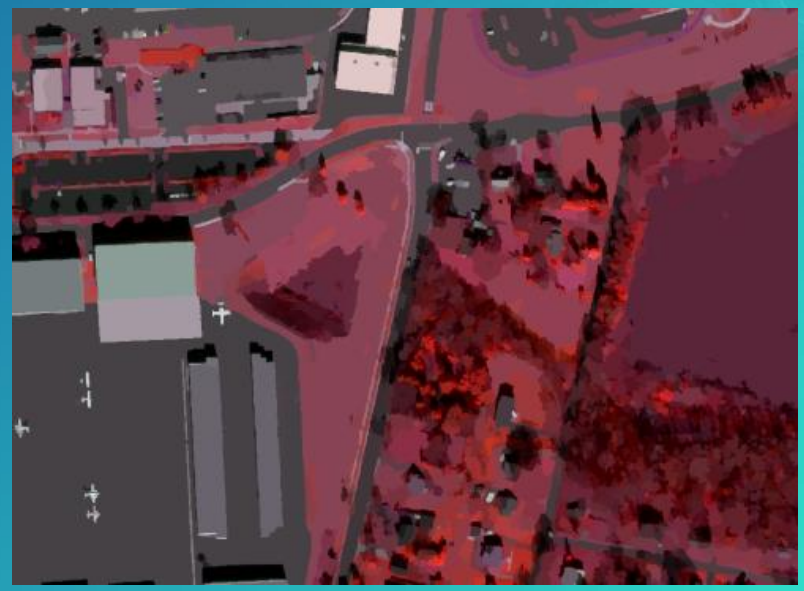

- Choose your best sensor
- Optimize for seasonality and phenomenology – timing is key
- Process effectively
  - Normalize for sensor anomalies
  - Understand your radiometry
  - Minimize any variation in your datasets

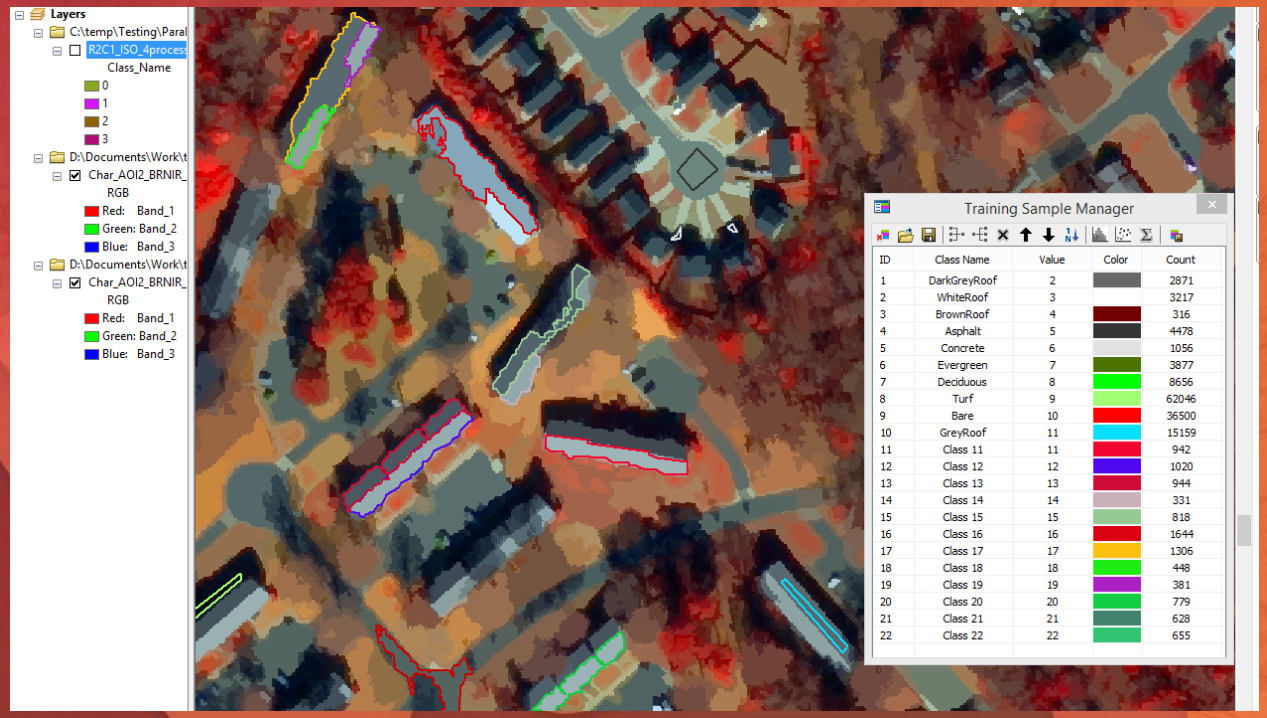
# Segmentation

## Preserving the object edges

- This technique helps
  - preserve edges of objects
  - Provides object specific values
- A pre-processing step
- Needs to be tuned to the production requirements



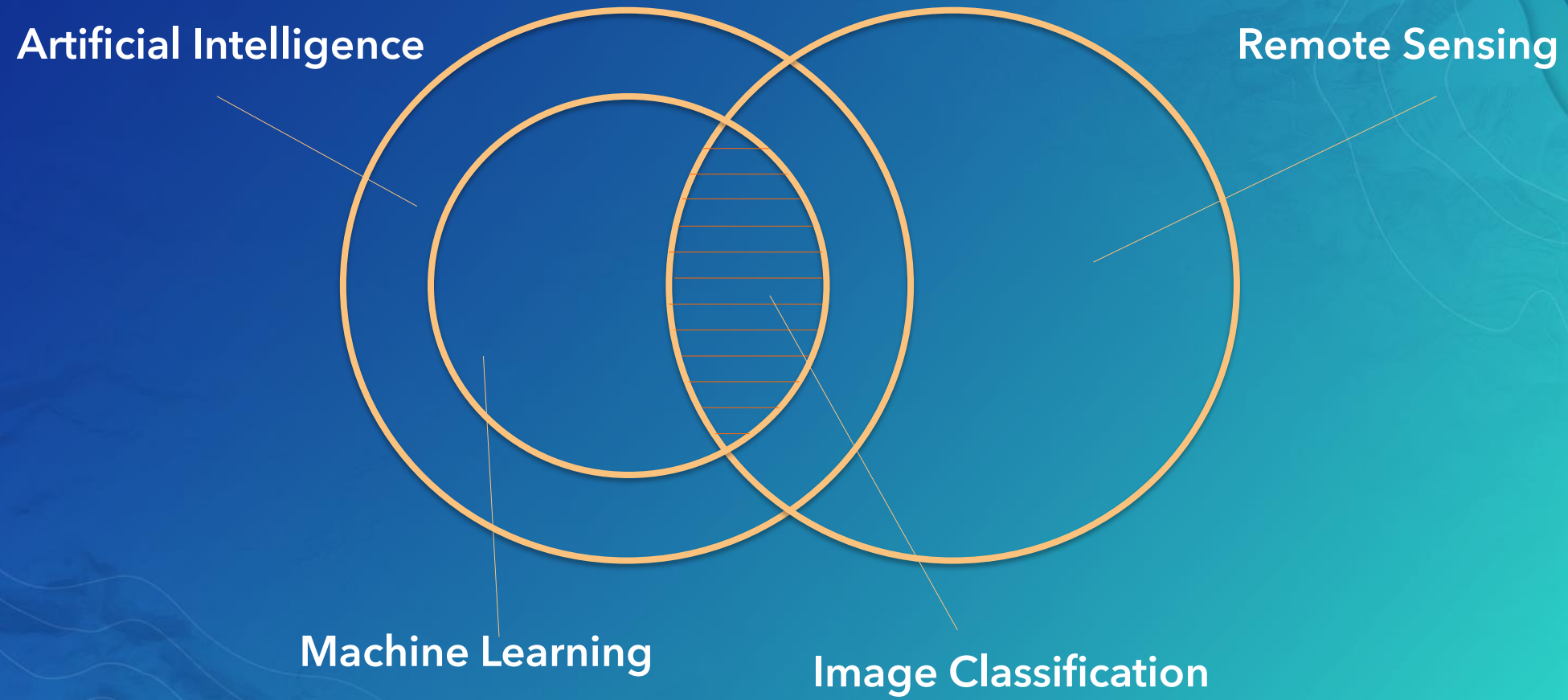





# Segmentation

Supporting Text

# Concept Diagram



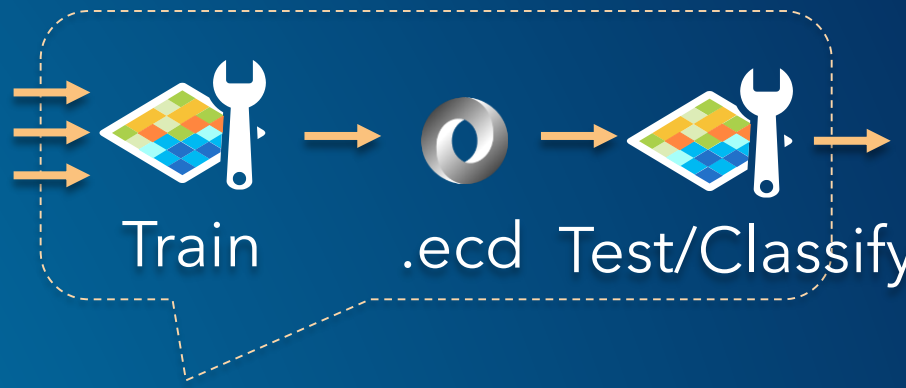
# Supervised Image Classification

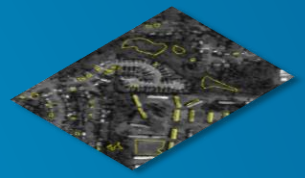
Input Image

Mean Shift Segmentation

Segmenter

Segmented Image



Training Samples

Training Augmentation

Generate training & inspect *

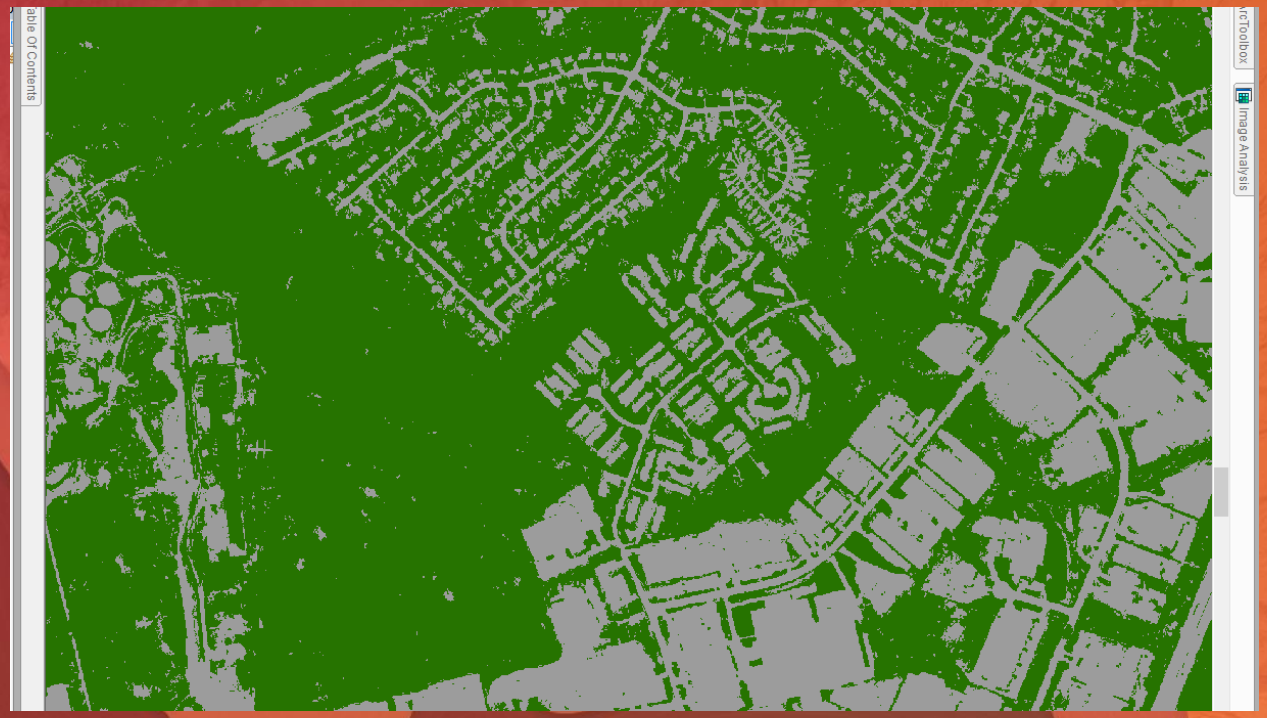
Classifier

Maximum Likelihood
Support Vector Machine
Random Trees

Classified Image

Accuracy assessment

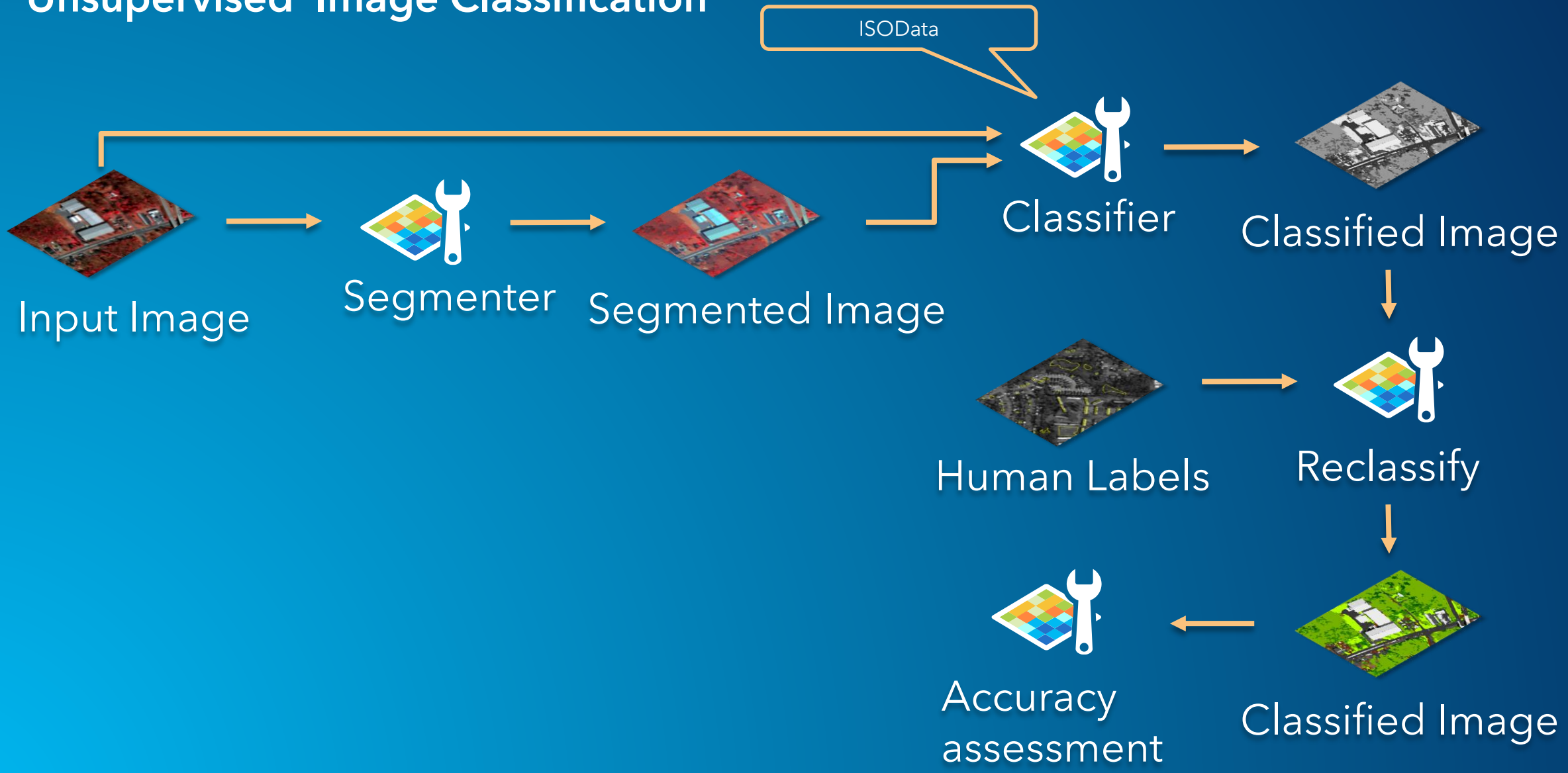
*** in development**

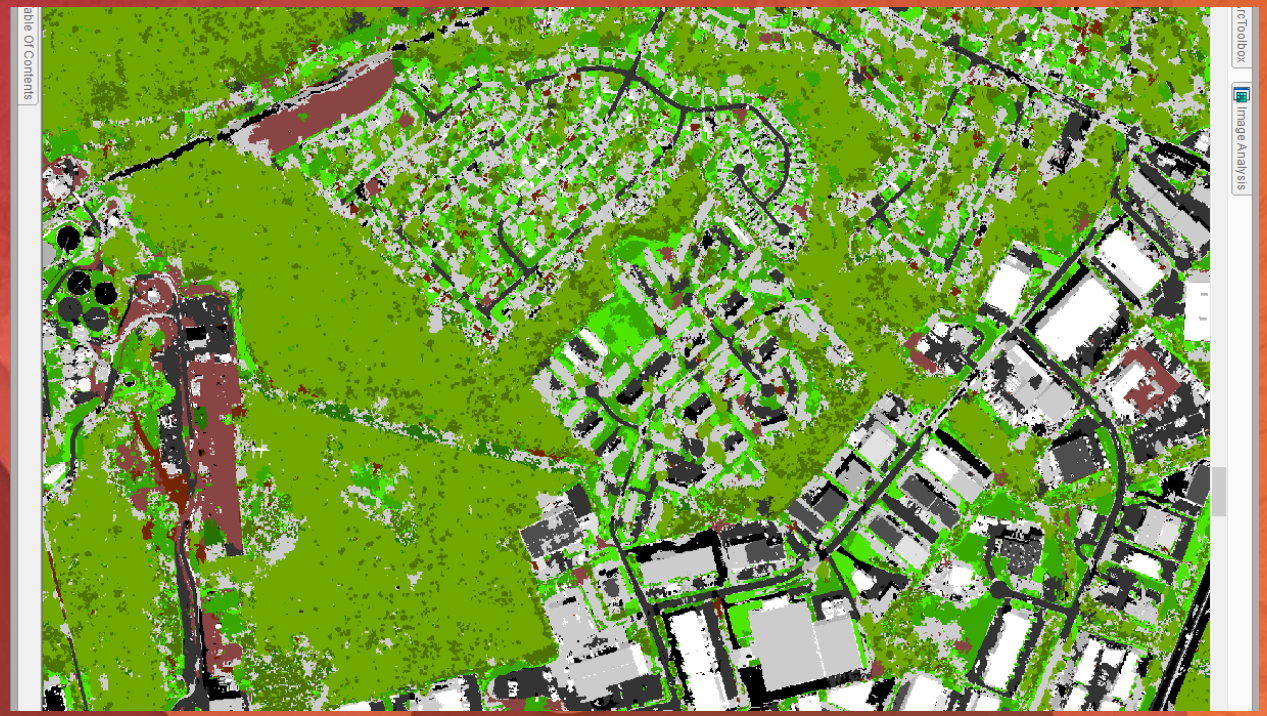



# Supervised Classification

Supporting Text

# Unsupervised Image Classification






# Unsupervised Classification

Supporting Text

# Support in different ArcGIS processing frameworks

| | On-the-fly Processing | Geoprocessing | Raster Analytics |
|---|---|---|---|
| Segment | √ | √ | √ |
| Train | | √ | √ |
| Classify | √ | √ | √ |

# Summary

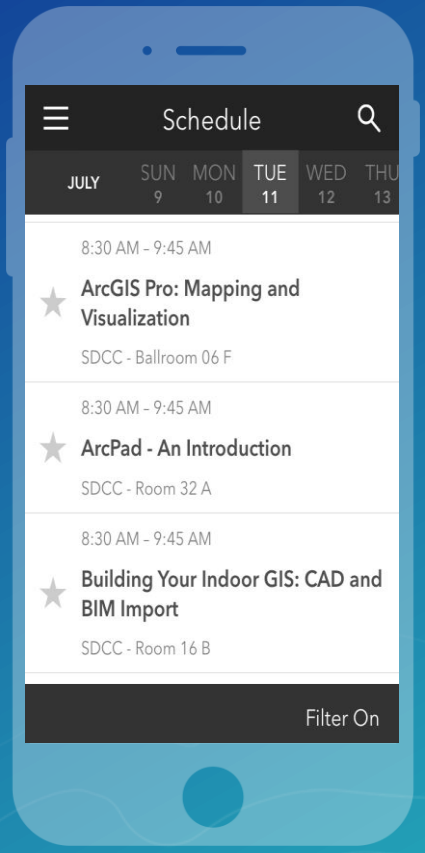
## Segmentation – Classification

- This is a comprehensive processing suite of tools
- It is based on both RFF and GPF
- It provides segmentation capabilities
- Traditional and machine learning classifiers

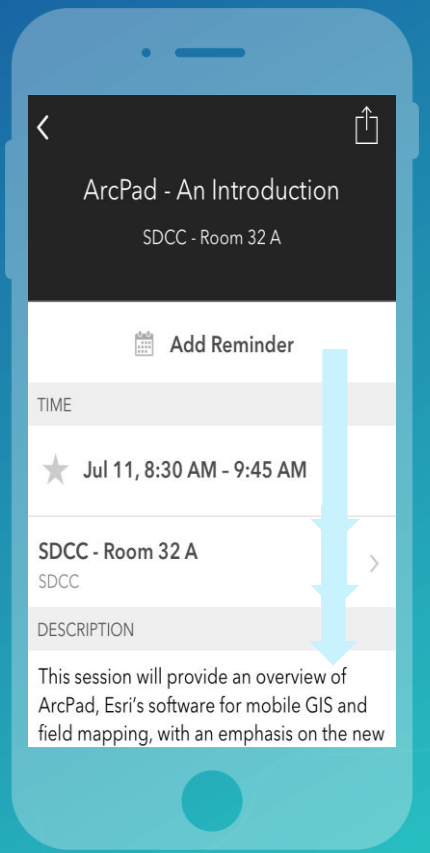
# Please Take Our Survey on the **Esri Events App!**

## Download the Esri Events app and find your event

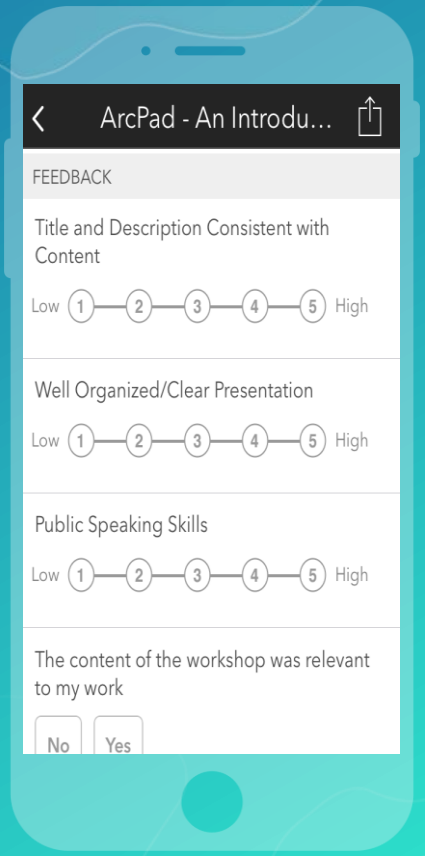

## Select the session you attended




## Scroll down to find the survey




## Complete Answers and Select "Submit"




esri
THE
SCIENCE
OF
WHERE