ArcGIS Image Analyst: An Introduction

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Presenters

Kyle Talbot

Solutions Engineer

Imagery and Remote Sensing

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Principal Product Manager

Imagery Analytics and AI

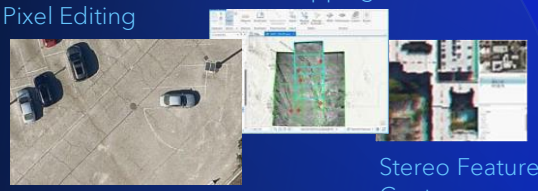
Imagery and Remote Sensing

ArcGIS is a comprehensive imagery system

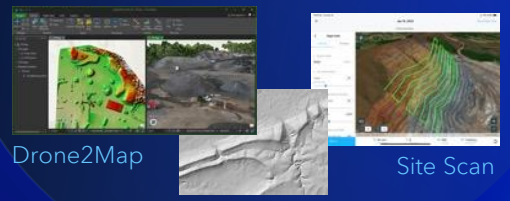
Map Production

Pixel Editing

Ortho Mapping



Stereo Feature Capture



Drone2Map

DTM Generation

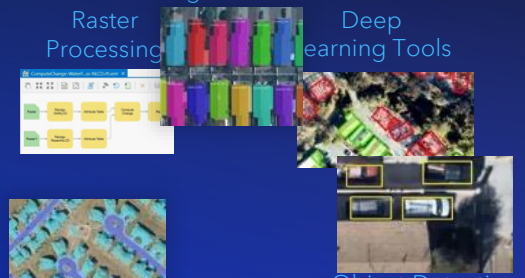
Site Scan

Analysis & AI

Segmentation

Raster Processing

Deep Learning Tools



Classification

Object Detection

Multidimensional

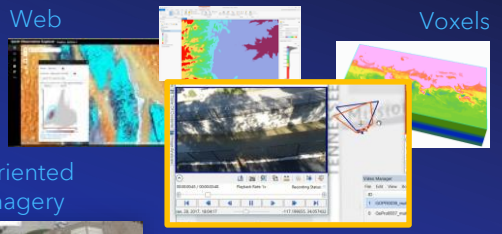
Change Detection

Visualization & Exploitation

Pro

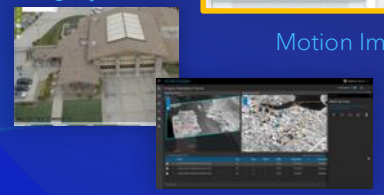
Web

Voxels



Oriented Imagery

Motion Imagery



Excalibur

Image Management

Streaming Multiband Tiles

Mosaic Datasets

Time

Image Cubes

Dynamic

Pre-Processed

Imagery & Raster Content

All Raster Types:

Formats

Platforms

Modalities

Services

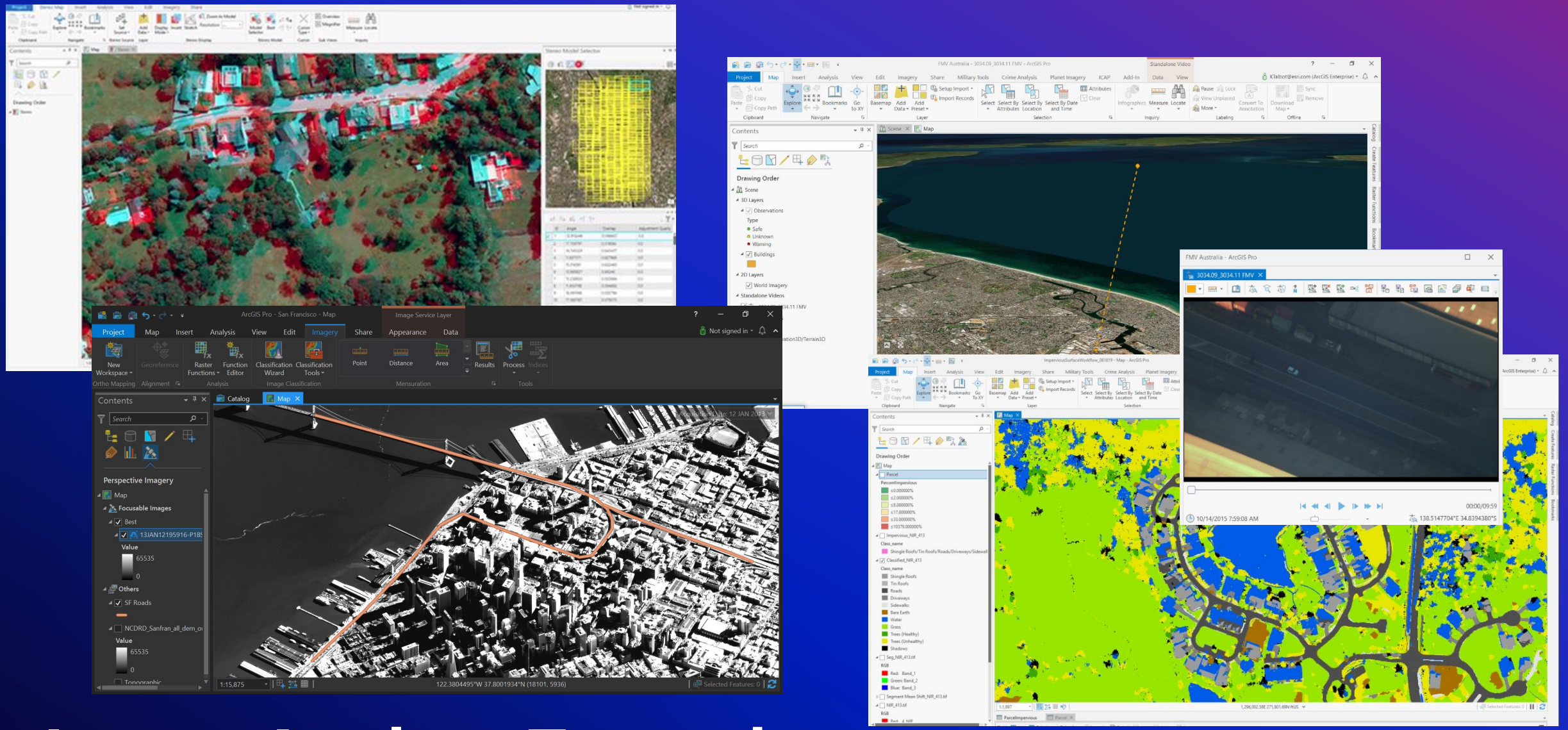


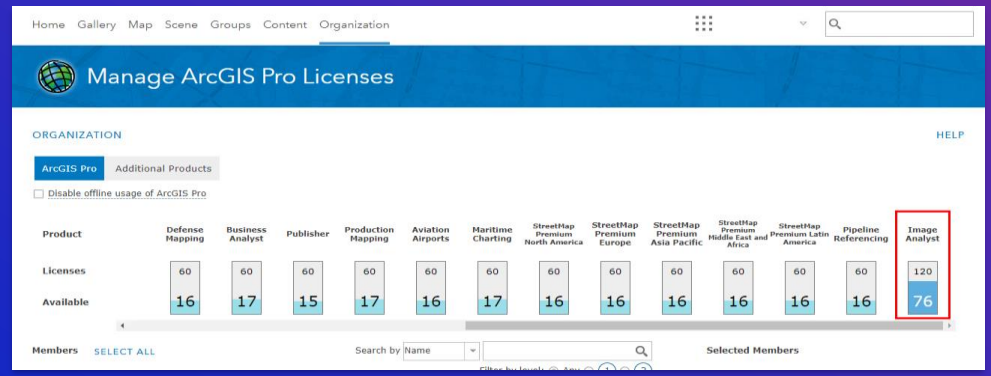
Image Analyst Extension

What is the Image Analyst extension?

- **The Image Analyst extension is an application extension which extends ArcGIS Pro with advanced imagery analysis tools, workflows, and user experiences.**
- **Image Analyst is for Image Analysts and Geospatial Analysts who focus on:**
  - visual enhancement and exploitation of imagery
  - creation of derived products from imagery
  - taking measurements from imagery
  - capturing features from stereo imagery
  - advanced analysis and image processing
  - advanced analysis of multidimensional raster datasets
  - exploitation and analysis of motion imagery (FMV)
  - extraction information from imagery using AI (deep learning) models
  - editing of imagery and raster datasets

Image Analyst extension Product Information

- **Availability**
  - first release was ArcGIS Pro 2.1
  - available for:
    - ArcGIS Pro Basic
    - ArcGIS Pro Standard
    - ArcGIS Pro Advanced
- **Pricing**
  - the same as the Spatial Analyst extension
- **Enterprise Agreements**
  - Category B (addition to the EA)
- **ArcGIS Image Server**
  - All Image Analyst capabilities which are available on the server are included at no additional cost!



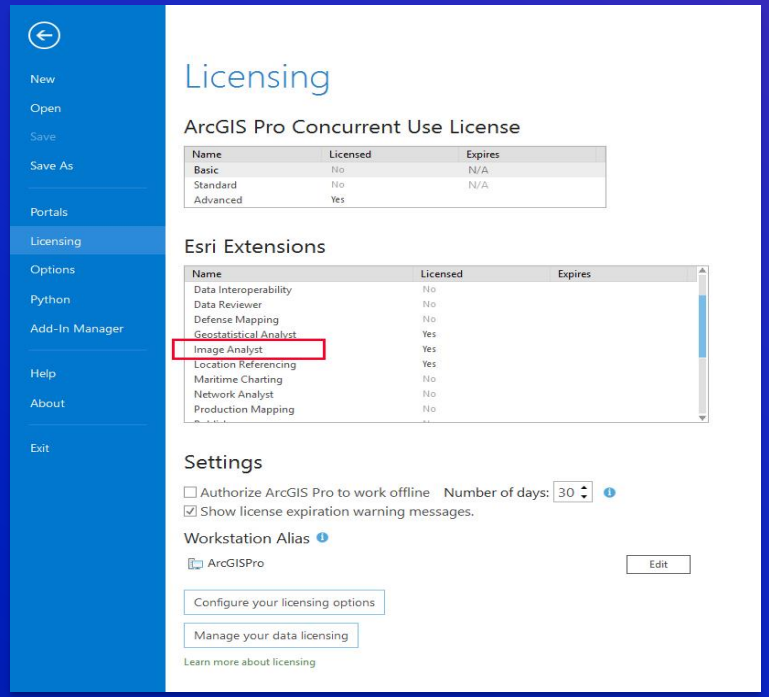


Image Analyst Capabilities

Stereo Mapping

Visualize imagery and capture 3D feature data in a stereo viewing environment.

Advanced Raster Functions

Perform real-time raster analysis and image processing on an extensive suite of remote sensing data types, and save your results if desired.

Image Classification

Perform object-based and traditional image analysis using image segmentation and classification tools and capabilities.

Advanced Multidimensional Analysis

Perform advanced raster modeling with multidimensional geospatial data using geoprocessing tools, Python, Notebooks, and the ArcPy API

Perspective Imagery

Work with oblique imagery oriented in a natural perspective mode to facilitate effective image interpretation applications.

Pixel Editor

Redact sensitive areas from images, clean up raster analysis results, and edit DEMs.

Motion Imagery

Work with geospatially enabled video data together with your GIS data to assist in timely, well-informed decision support.

Deep Learning

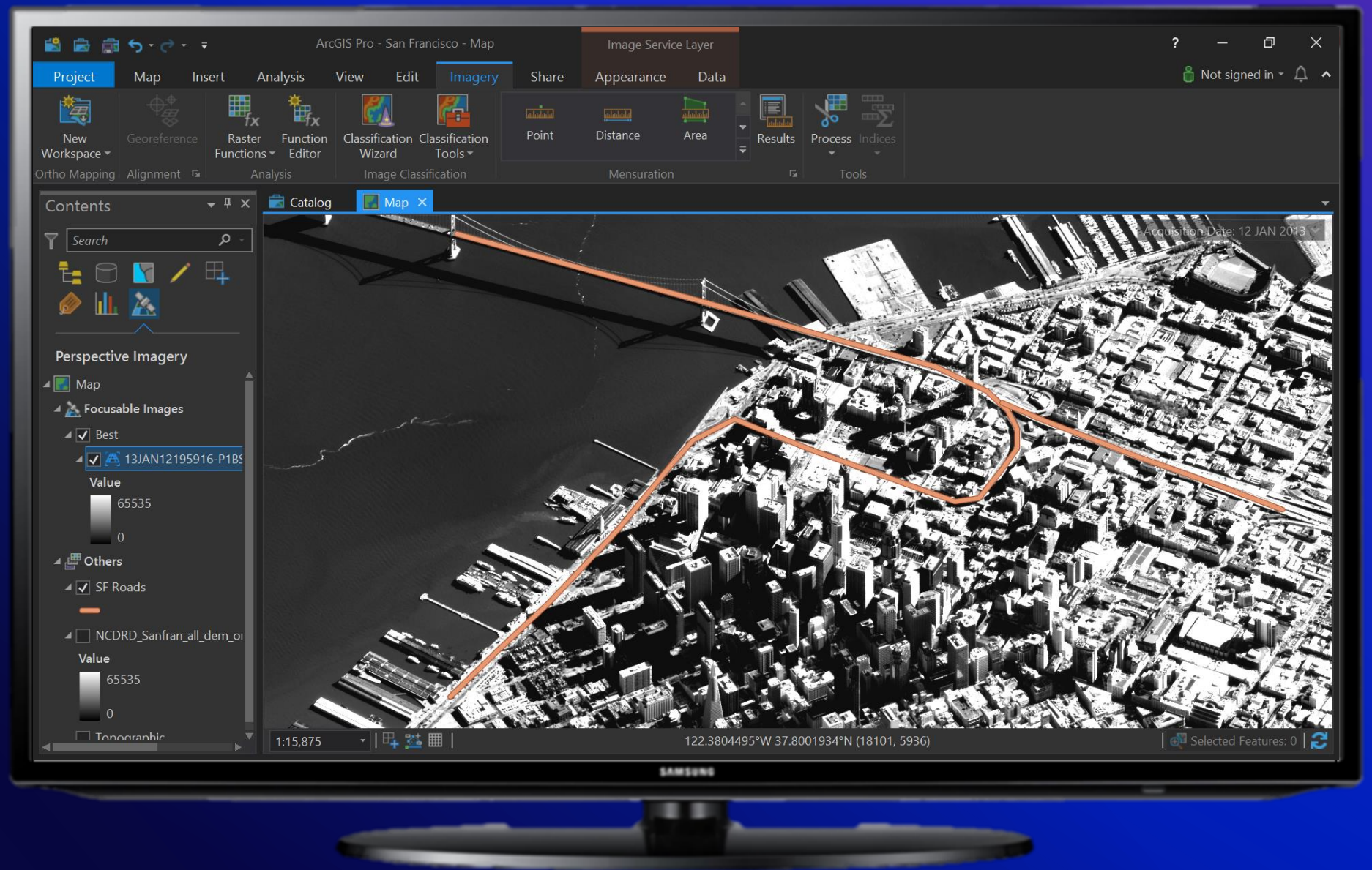
Extract geospatial features from imagery using deep learning techniques such as object detection and image classification / segmentation

Change Detection

- Perform pixel-to-pixel or time-series based change detection using intuitive wizards, geoprocessing tools, and the ArcPy API

Image Coordinate Space

ArcGIS Pro with Image Analyst Extension

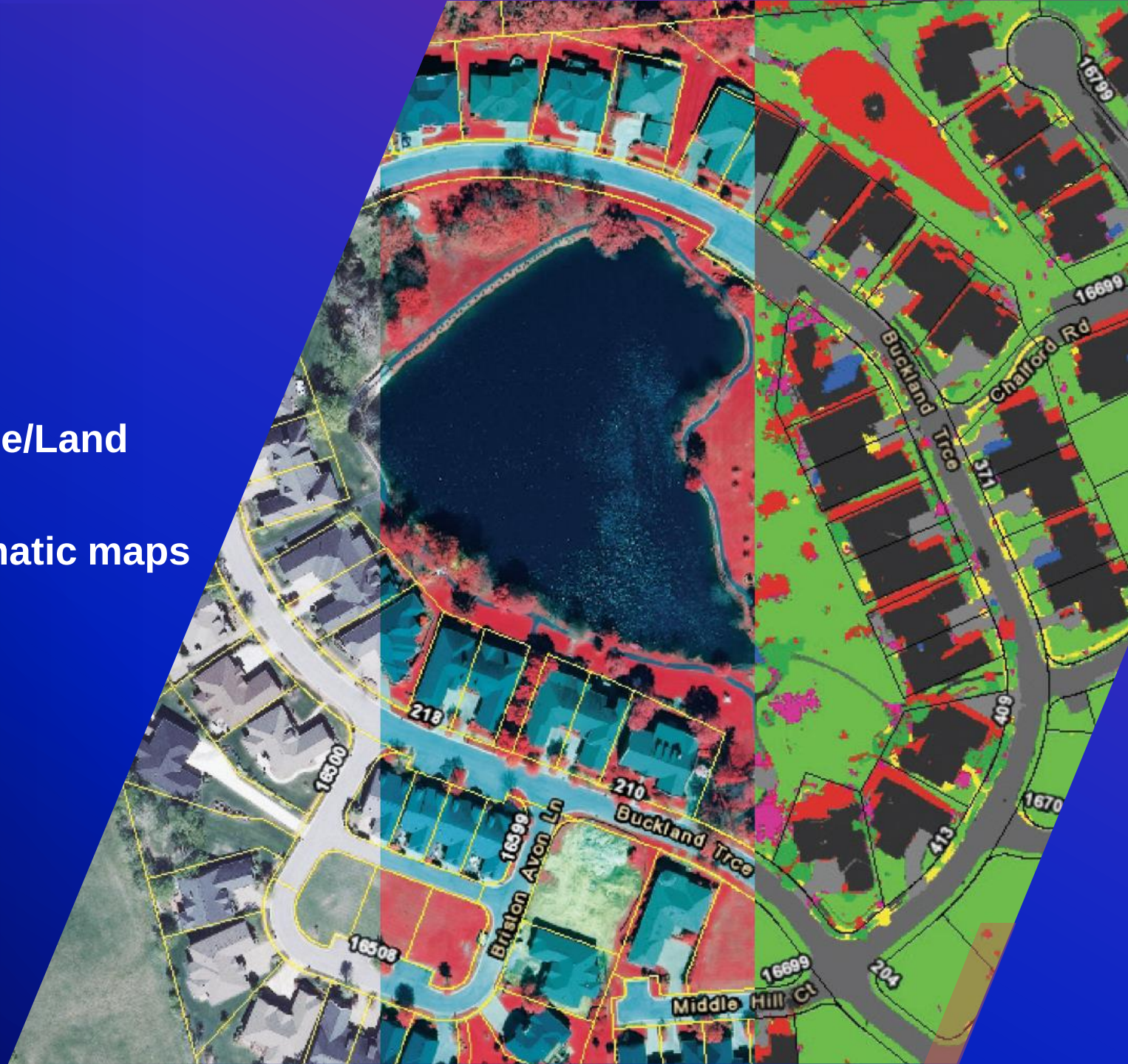


Capabilities:

- Work with highly-oblique imagery
- Switch between map-centric and image-centric views
- Capture feature information correctly

Image Classification Tools

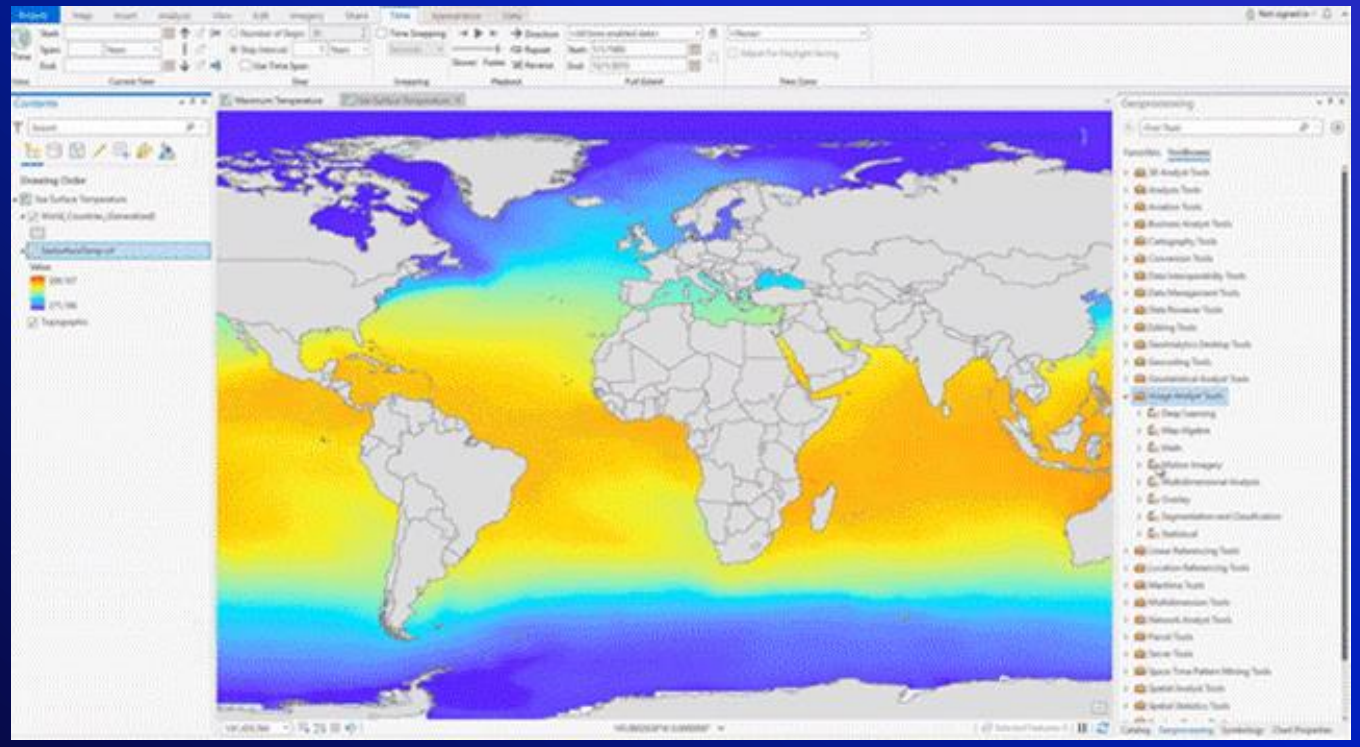
- Supervised or Unsupervised
- Object or Pixel Based
- Assigning Classes in a Land Use/Land Cover System
- Outputs are used to create thematic maps
- Supporting Layer in a GIS



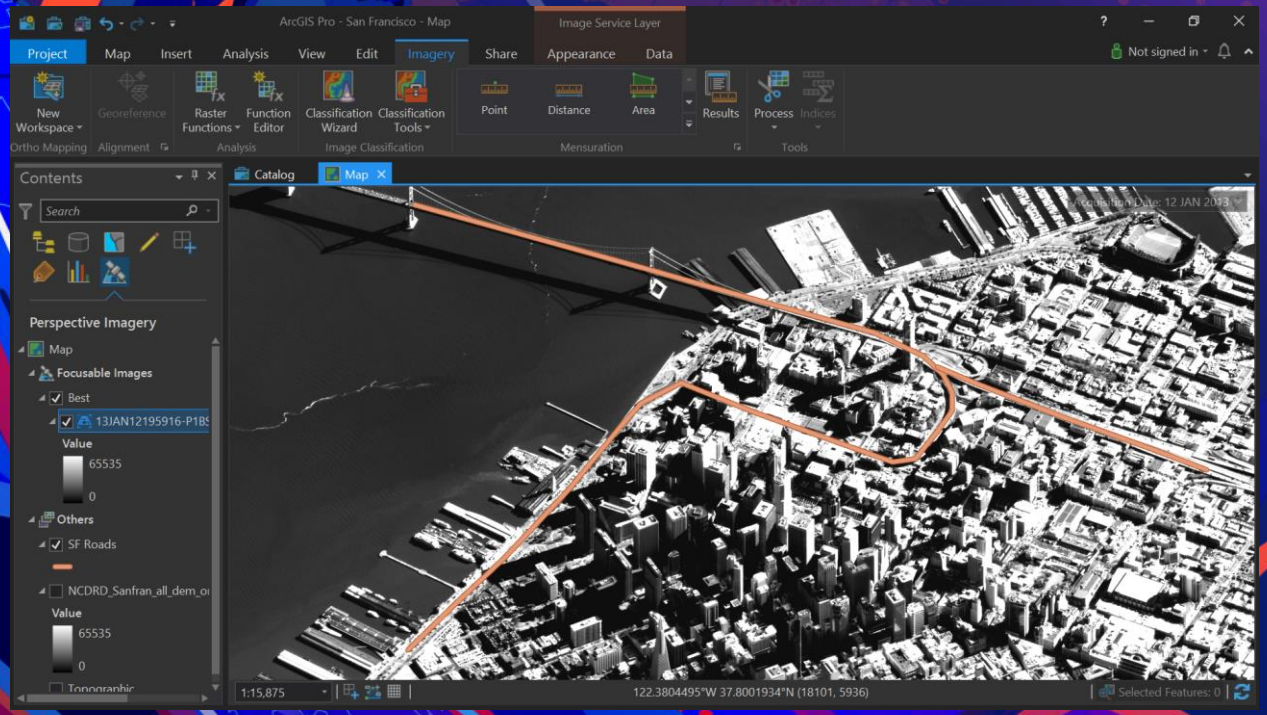
Pixel Editor

- Manipulate pixel values for raster and imagery data
  - Elevation data
  - Reclassify
  - Redaction
  - Replace clouds

Multidimensional Rasters



- Create and manage datasets
  - Dedicated multidimensional tab
  - Data management group
- Explore
  - Extent group
  - Current Display Slice
- Perform complex analysis
  - Temporal profile charts
  - Geoprocessing tools
    - Aggregate
    - Anomaly
    - Trend



Demos

Kyle Talbot
Vinay Viswambrahan

What's New

Deep learning

- New models and tools

Change detection

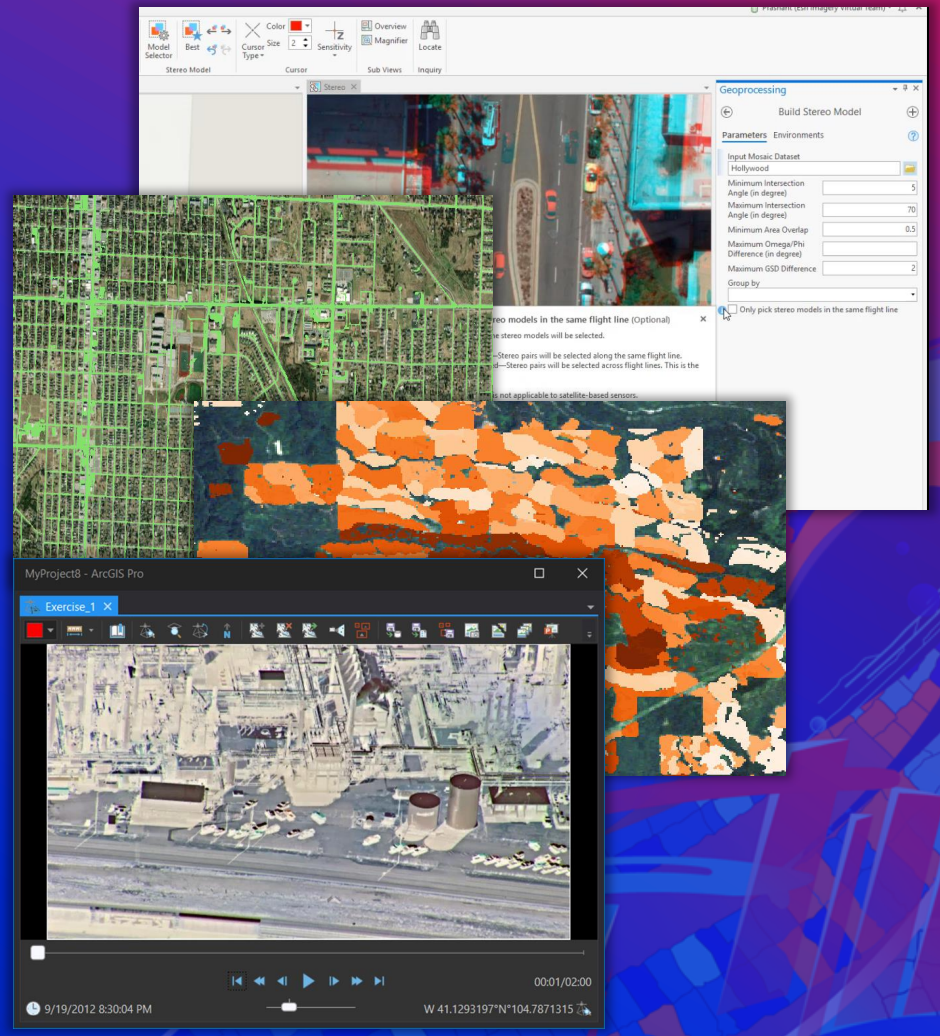
- New wizard and algorithms

Stereo mapping

- User experience improvements when working with stereo collections

Motion imagery

- Time slider improvements
- Application settings
- UX improvements

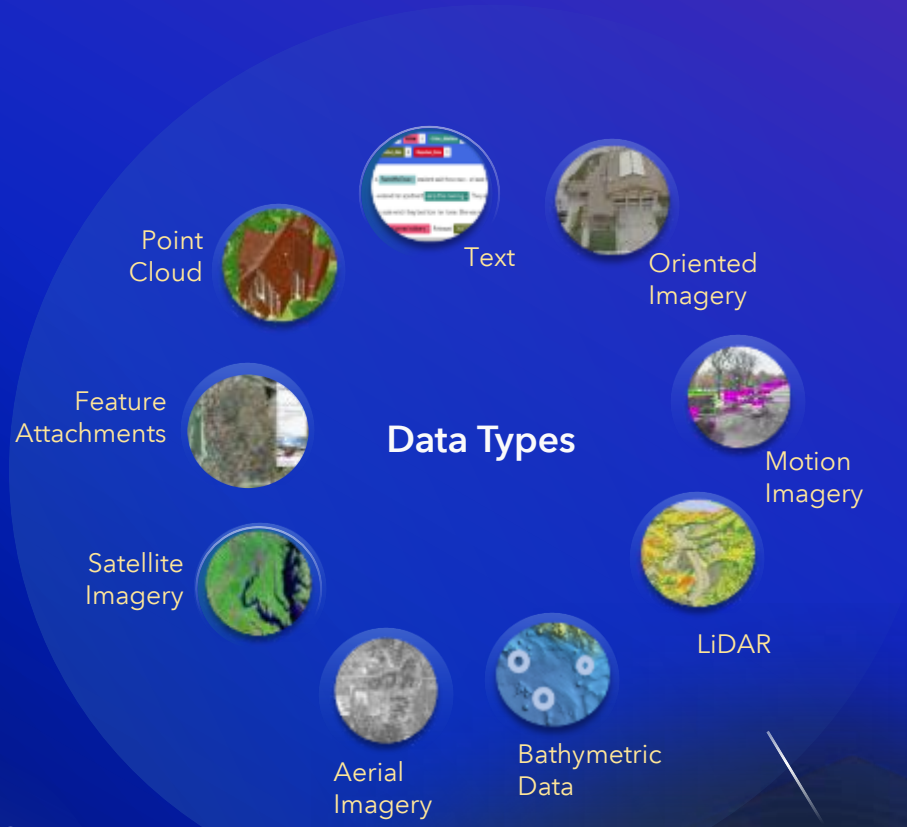


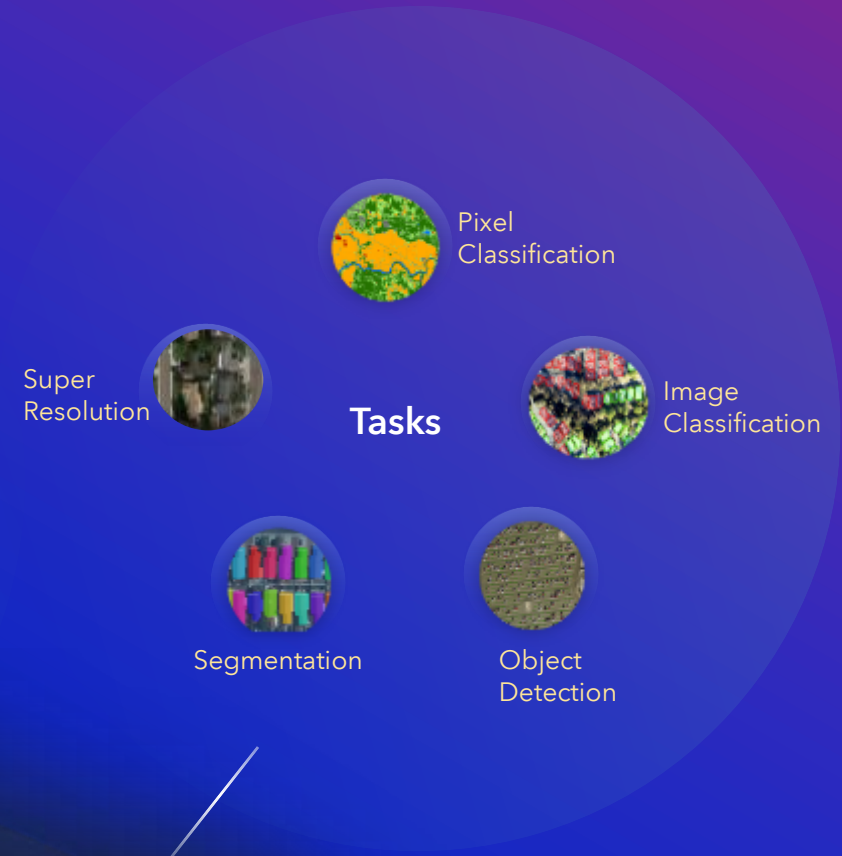
Deep Learning

New model and tools

New

- FasterRCNN
- YOLOv3
- Multispectral support
- Sparse training
- Multilabel classification





Integration

Deep Learning

New model types

New Object Detection Models

- YOLOV3
- FasteRCNN

Applications

- Detect cars, trees, planes
- Shipwrecks
- Fire hydrants
- Detect encroaching features

New Pixel Classification Models

- DeepLab

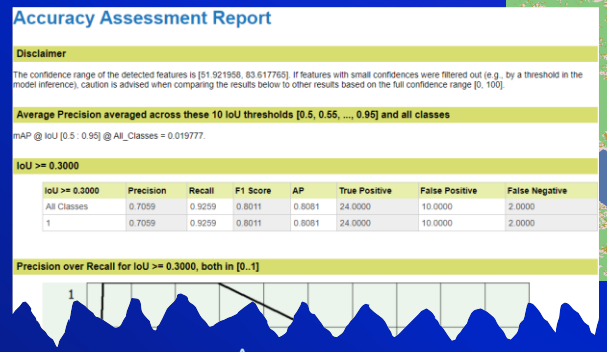
Applications

- Extract road networks
- Routing

Deep Learning

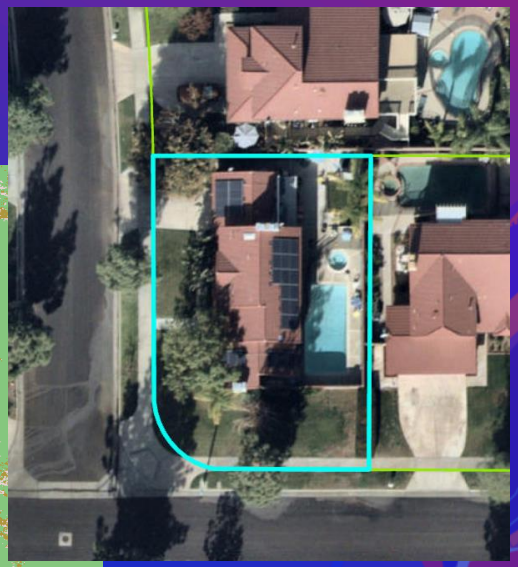
Multispectral Imagery

- Perform training on multispectral imagery
- Enhanced training for better results especially with sparse training data
- Enhance “Feature Classification” model type to classify a feature into Multiple labels
- Better accuracy assessment results
  - Recall
  - Precision
  - F1score
  - Average Precision

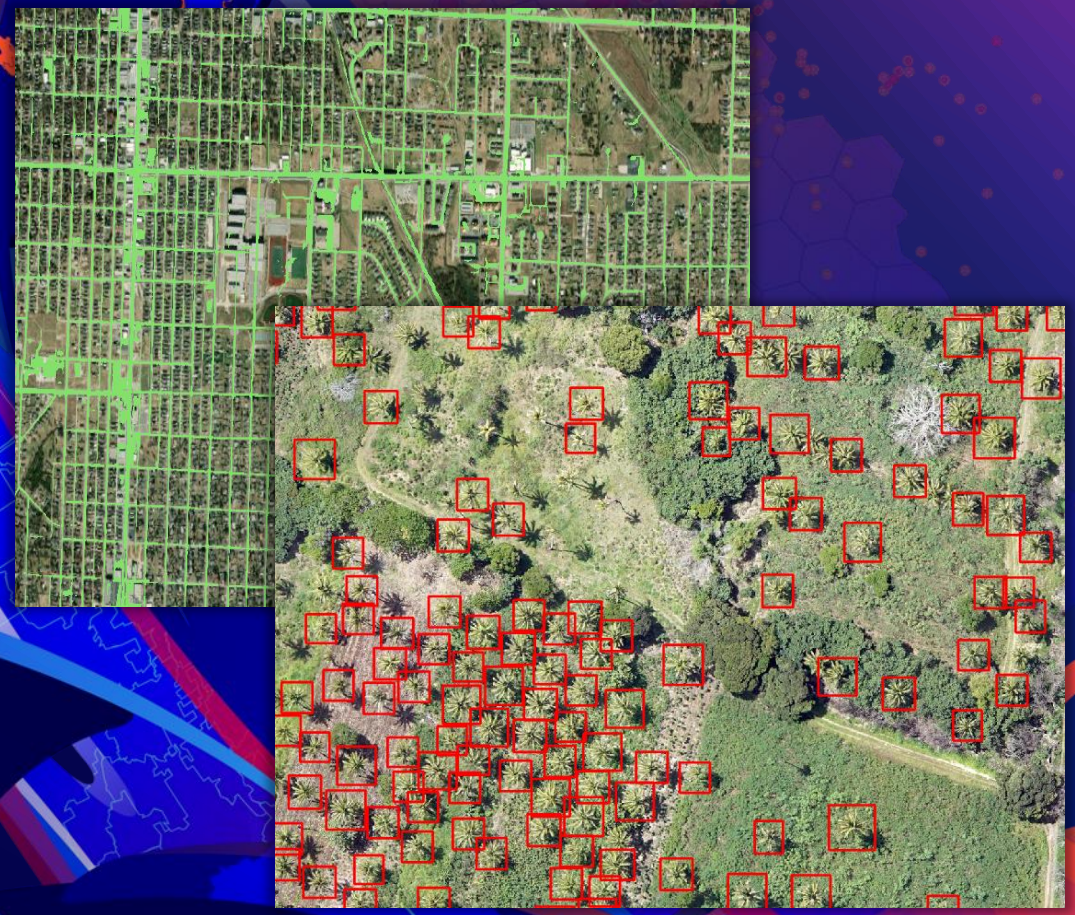


Accuracy assessment

Multilabel classification



Multilabel classification

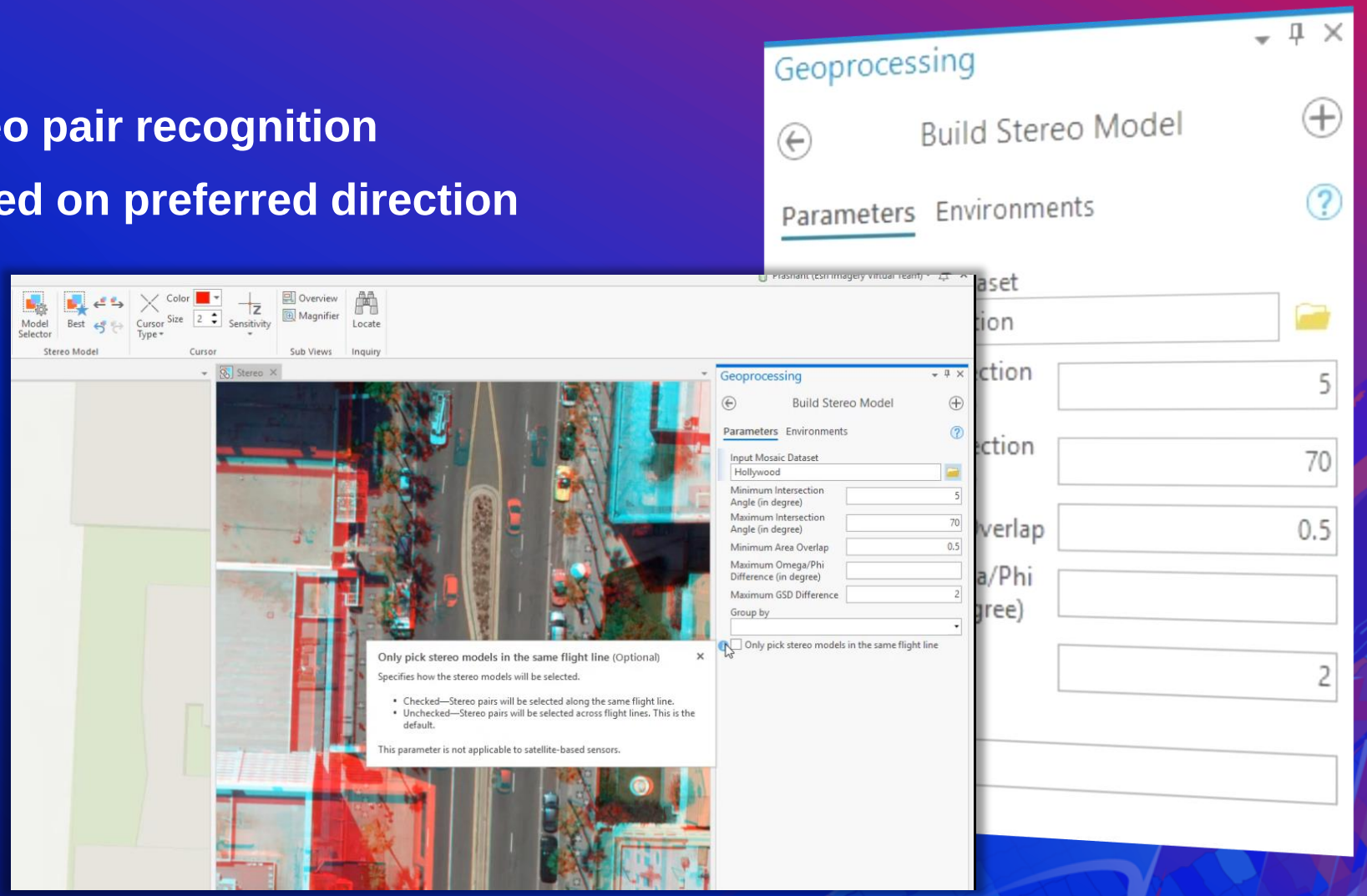


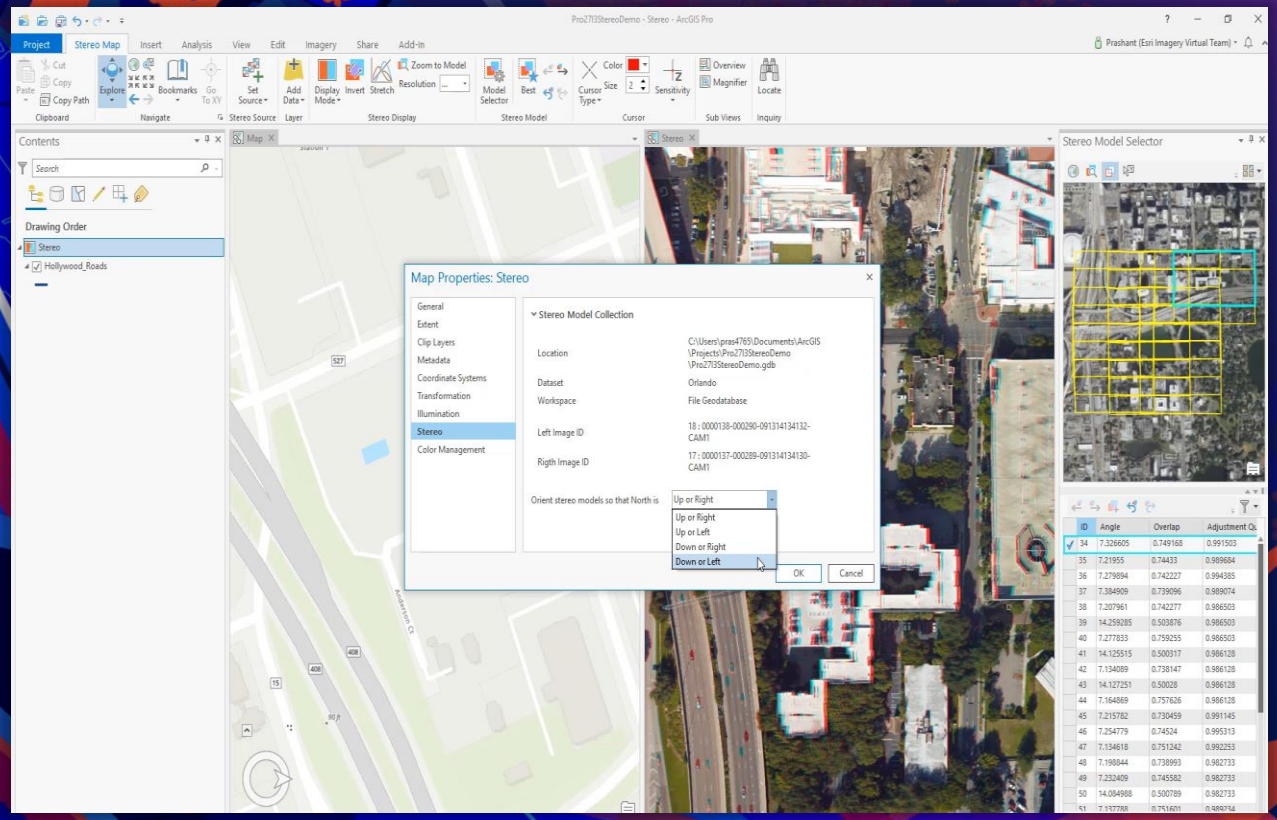
Demo - Deep Learning in ArcGIS Pro

Vinay Viswambrahan

Stereo Mapping

- **More control over stereo pair recognition**
- **Orient stereo pairs based on preferred direction**





Demo - Stereo Mapping

Kyle Talbot

Change Detection

Compare images or time-series data

Image to Image Change Detection

2 images
Identify what are the changes
Simple static change detection
Percent Change
Change in Categorical data

Time Series Analysis

Time series data
CCDC and LandTendr
Identify when is the change and then explor

Detecting Change

Most recent
Number of changes
Earliest
Largest change
Duration of change

Classify

Classify time Slices
Can be Input to simple change

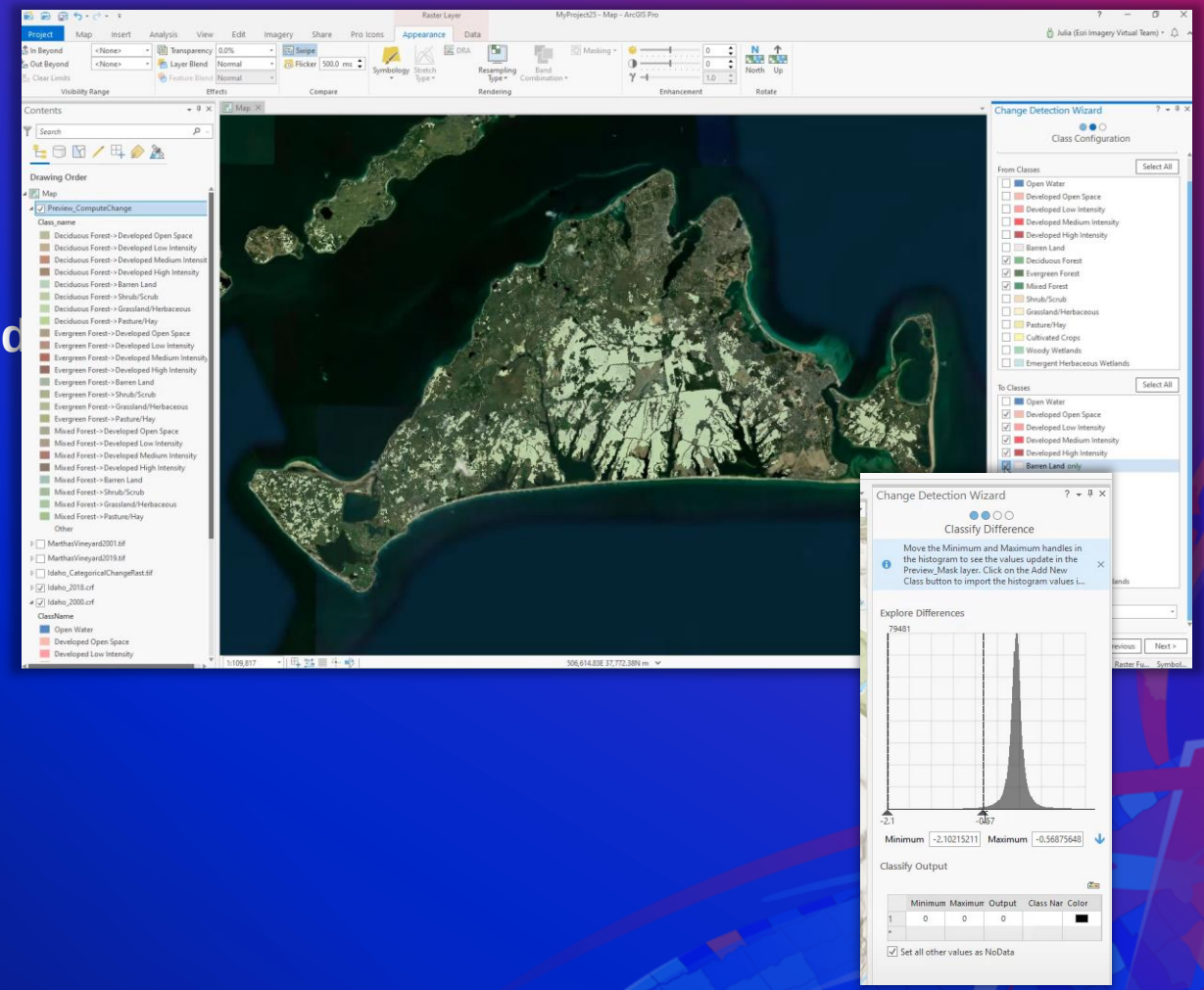
New

- Change detection wizard
- LandTrendr change detection

Change Detection

Change detection wizard

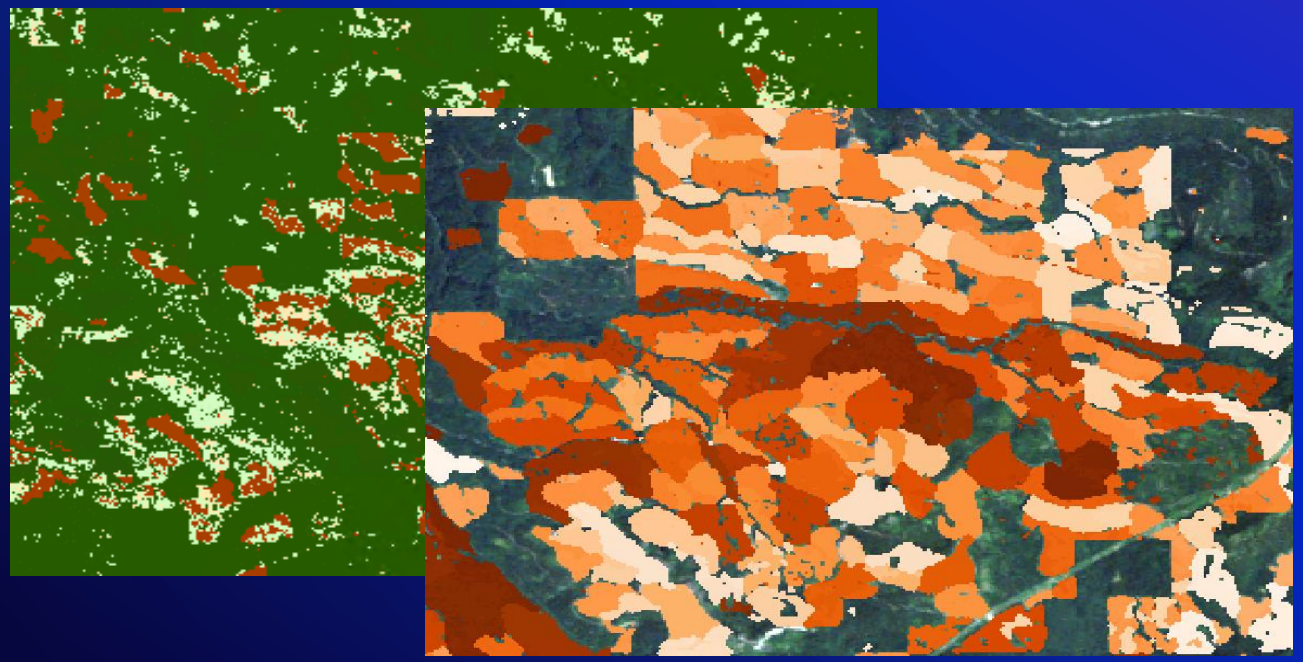
- **Guided workflows for:**
  - **Categorical change detection**
  - **Time-series change detection**
  - **Pixel-value change detection**
- **Includes predefined differences based on ind**
- **Postprocessing cleanup tools**
  - **Remove noise (neighborhood smoothing)**
- **Ability to write out**
  - **Function rasters**
  - **Raster function template**
  - **Persisted dataset**
  - **Feature class**

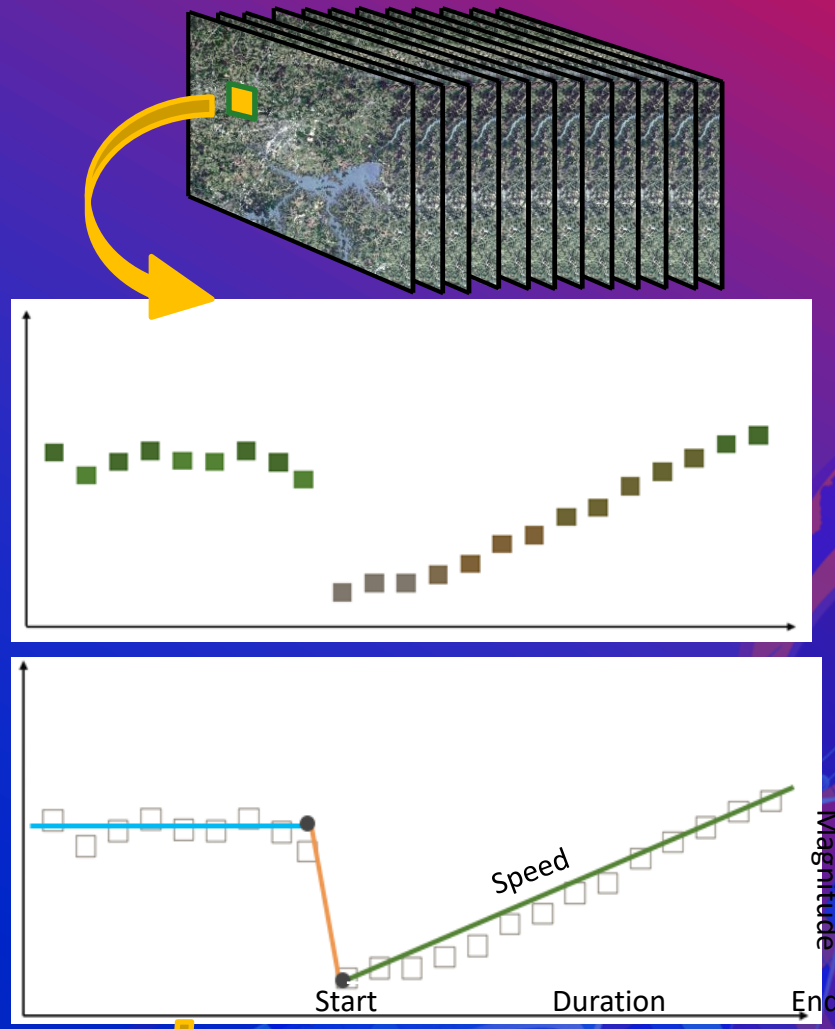


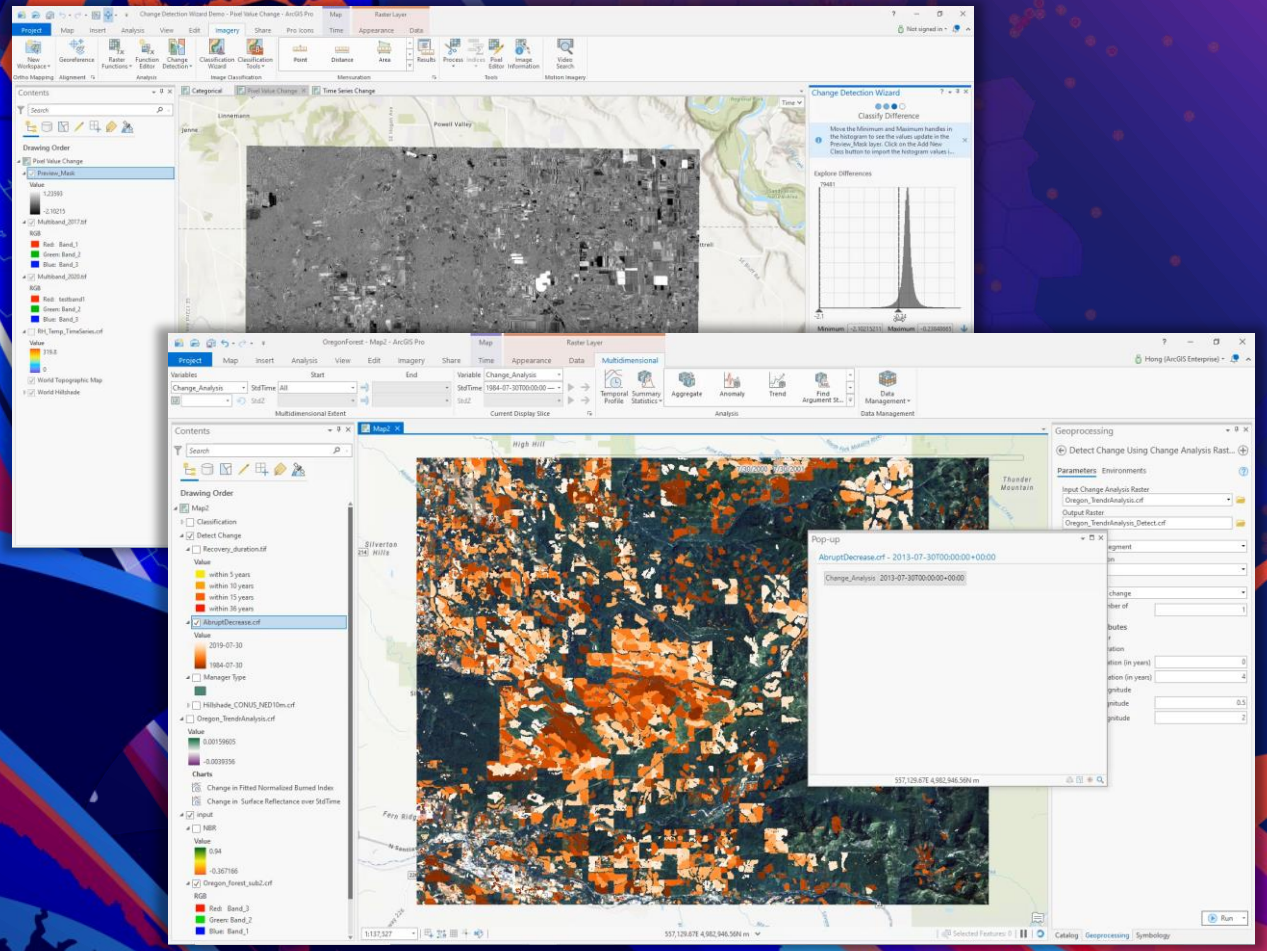
Change Detection

Landsat based detection of trends in disturbance and recovery

- **New *Analyze Changes Using LandTrendr* tool**
- **Enhanced *Detect Change Using Change Analysis Raster* tool**







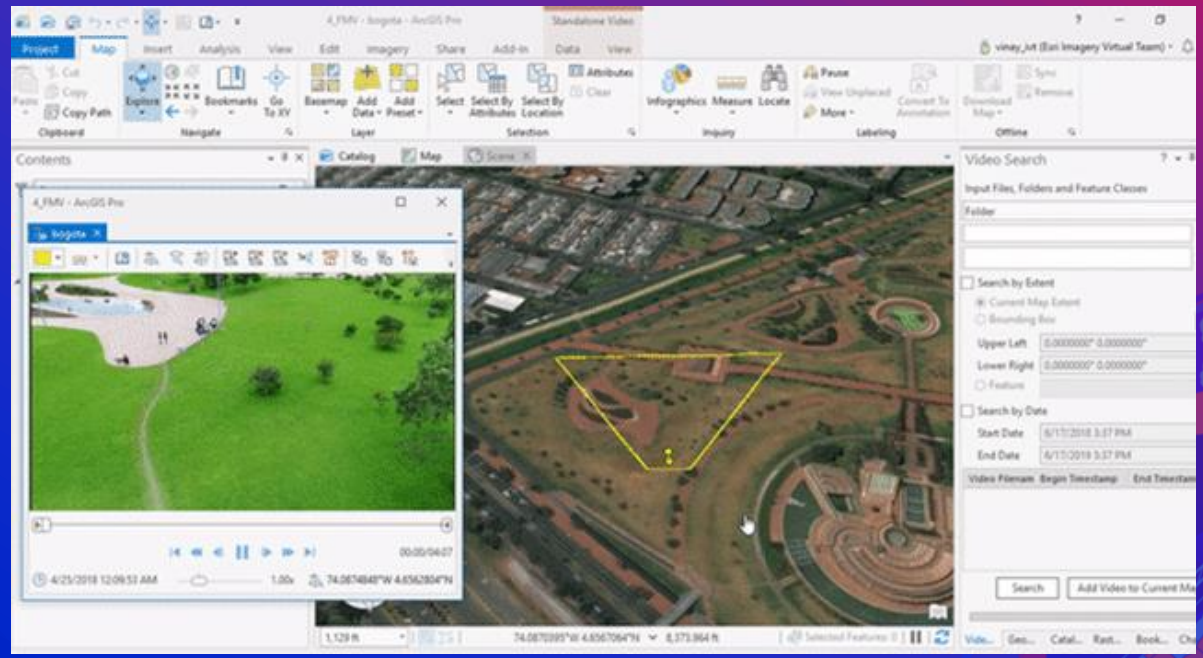
Demo – Change Detection

Vinay Viswambrahan

Motion Imagery

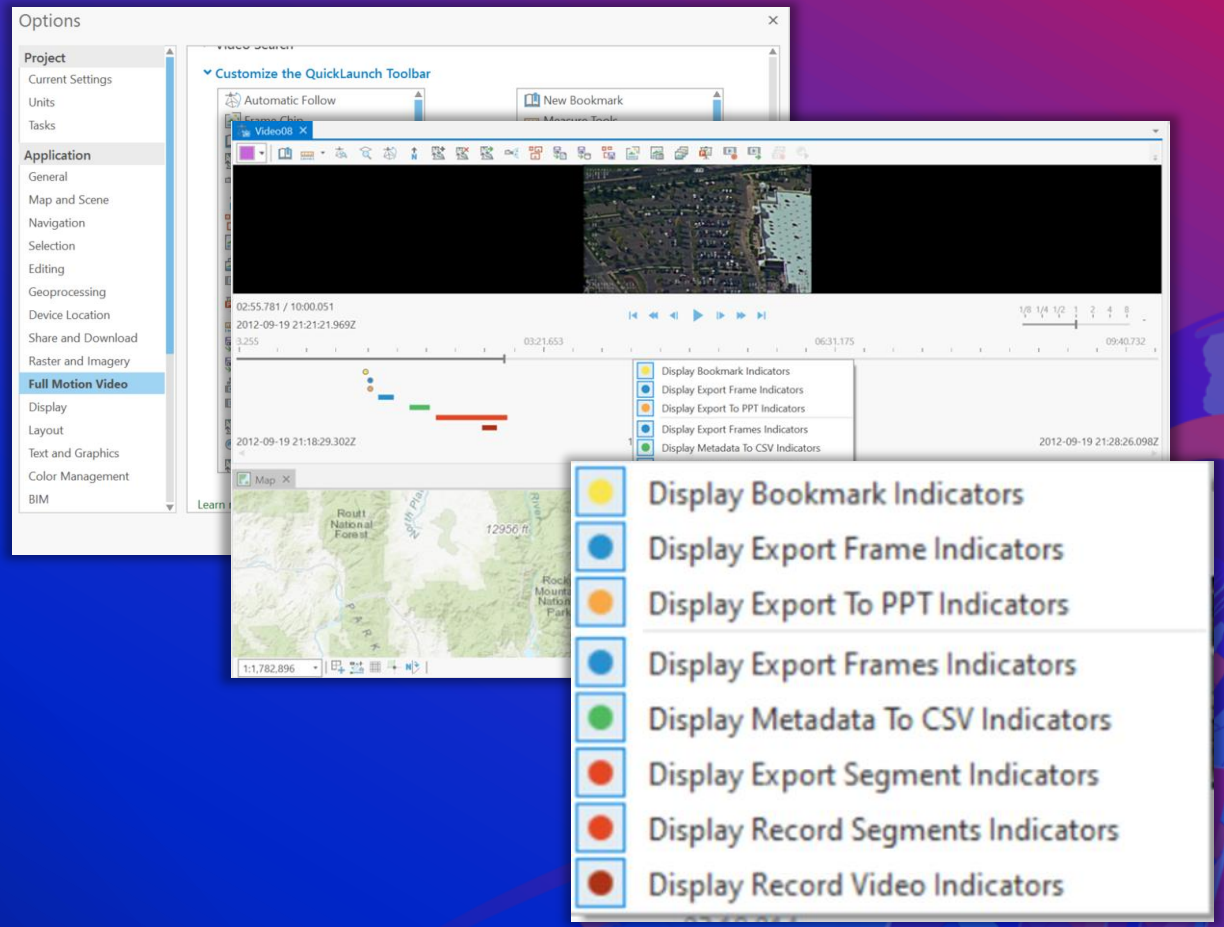
Make informed, timely decisions

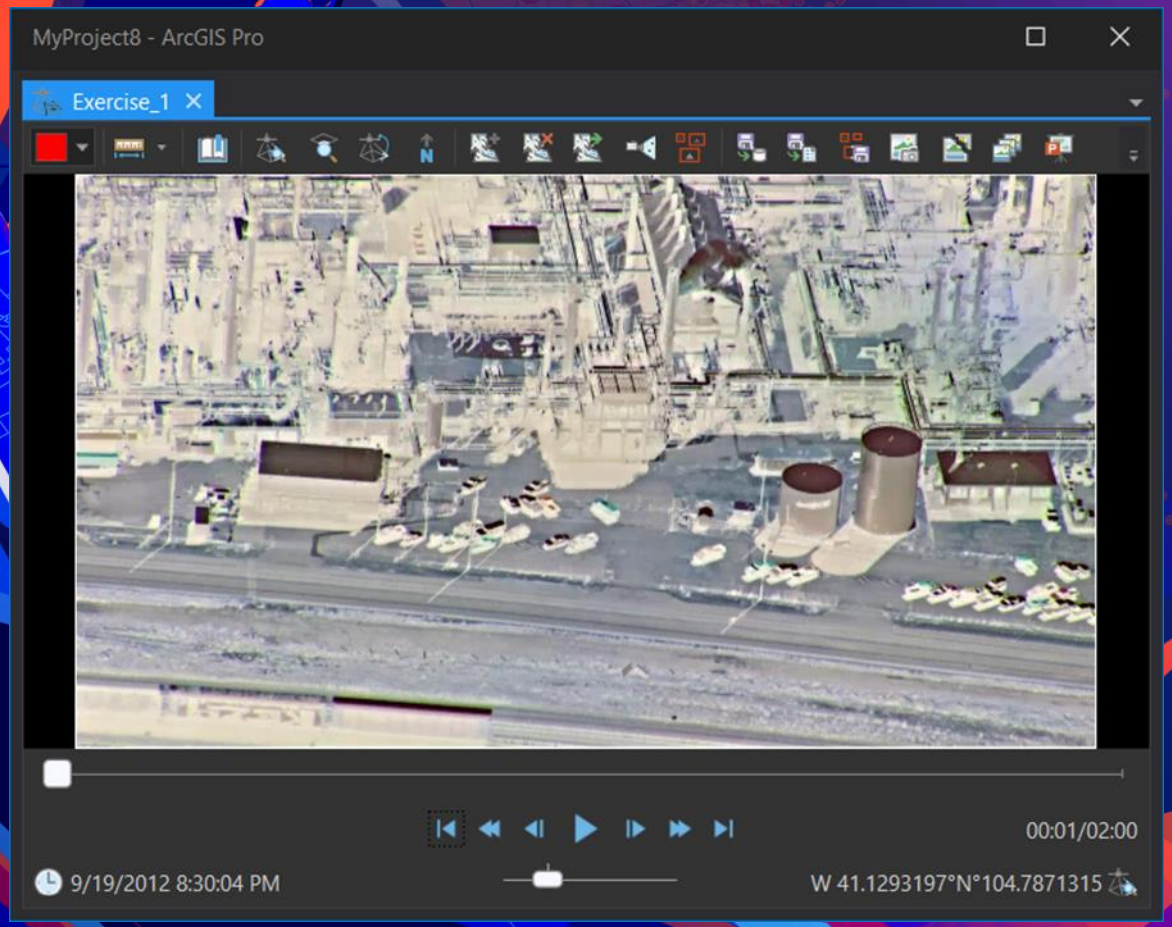
- **Integrate**
  - Seamlessly view and capture features from your videos and maps
- **Reporting**
  - Efficient reporting capability for decision makers
- **Compatible**
  - Directly use video with MISB-formatted metadata, or use the Multiplexer to convert video to MISB compatible format



Motion Imagery Enhancements 2.7

- Configurable Controls for Video Player Window
- Interactive Time Slider showing where bookmarks, snaps, recordings, and features were created
- Jump to Frame to easily go to an exact frame in a video
- Frame Dropping Support
  - Better support for > 30 fps



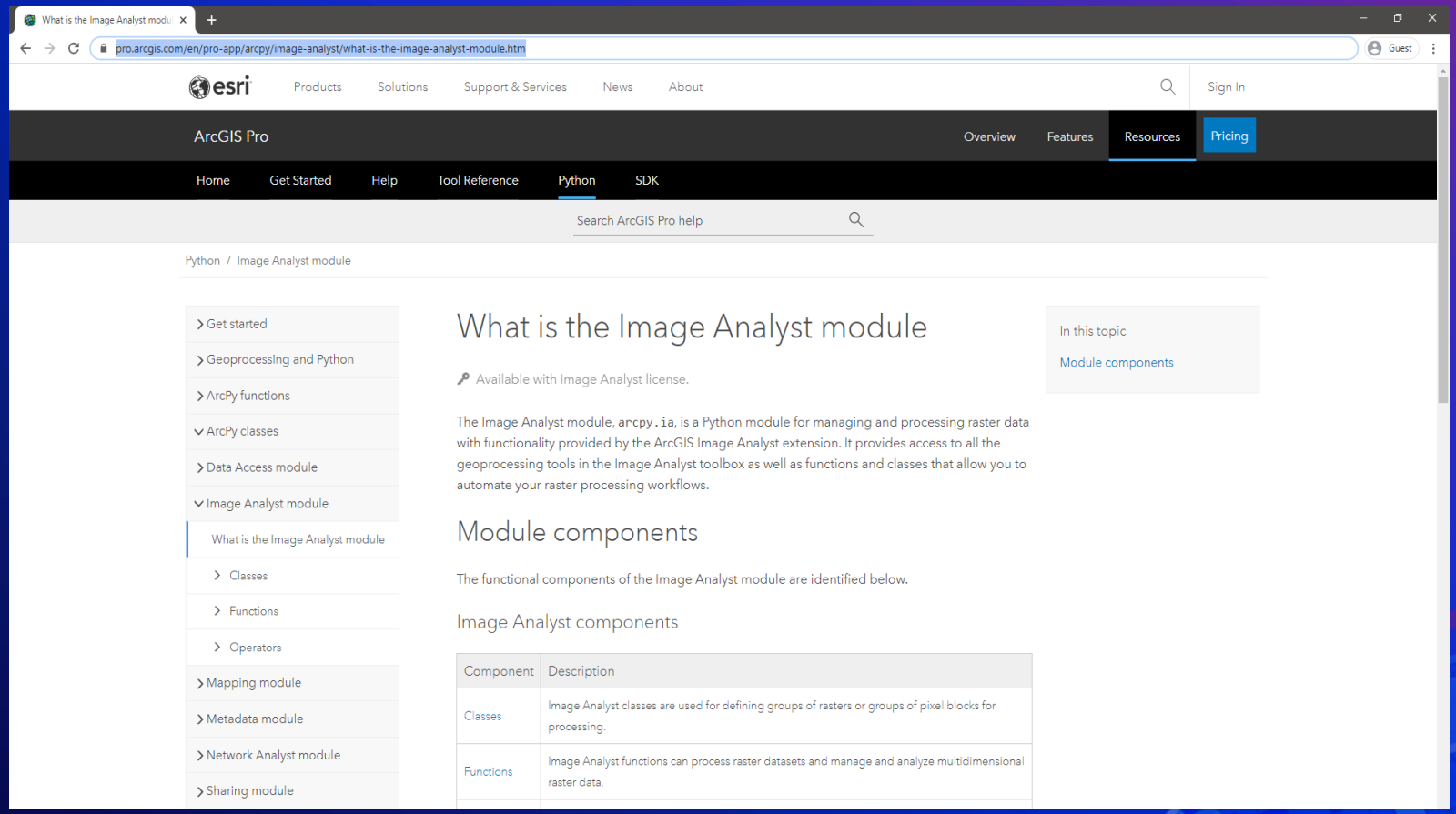


Demo – Motion Imagery

Kyle Talbot

ArcPy APIs in ArcGIS Pro 2.6

- **66 new ArcPy APIs were added to the arcpy.ia module**
  - 6 are specifically licensed to Image Analyst
  - 60 are licensed across basic, standard, and advanced
  - https://pro.arcgis.com/en/pro-app/arcpy/image-analyst/what-is-the-image-analyst-module.htm



ArcPy Functions for Raster Analysis in ArcGIS Pro 2.7

New raster functions

Conversion

RasterizeFeatures
TrendToRGB

Reclass

ZonalRemap

Analysis

ComputeChange
GenerateTrend
PredictUsingTrend
DetectChangeUsingChangeAnalysis
WeightedRasterSum
WeightRasterOverlay

Data Management & Conversion

Buffered
Reproject

Classification

Classify
LinearUnmixing
RegionGrow
SegMeanShift

Math

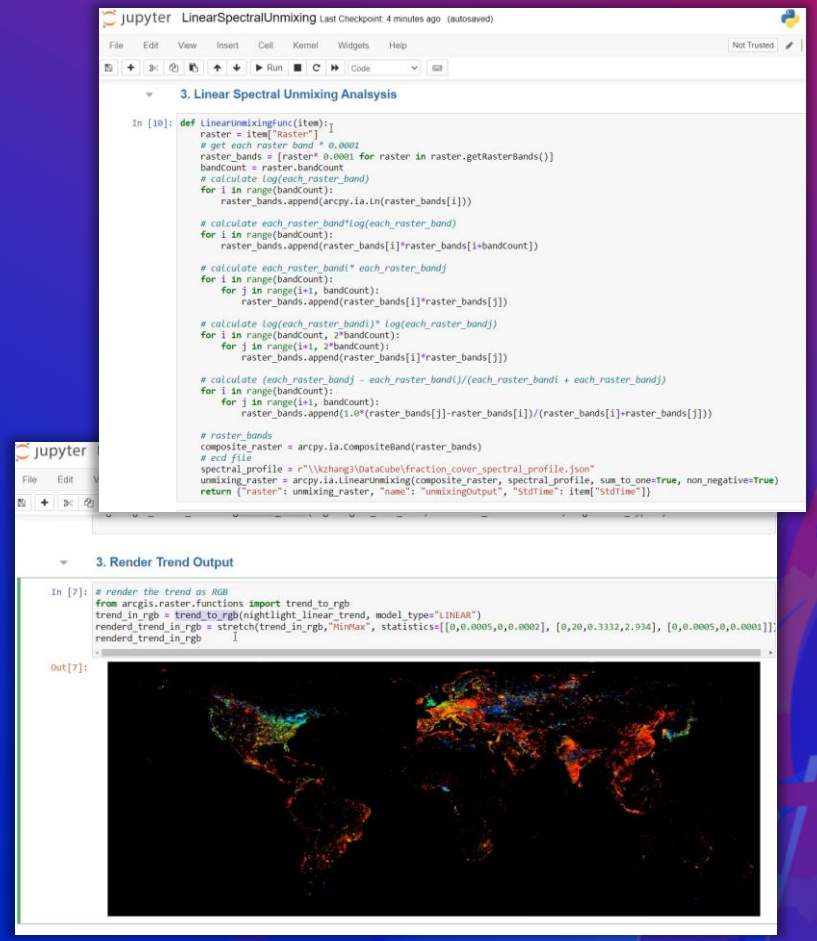
BAI
NBR
NDBI
NDSI

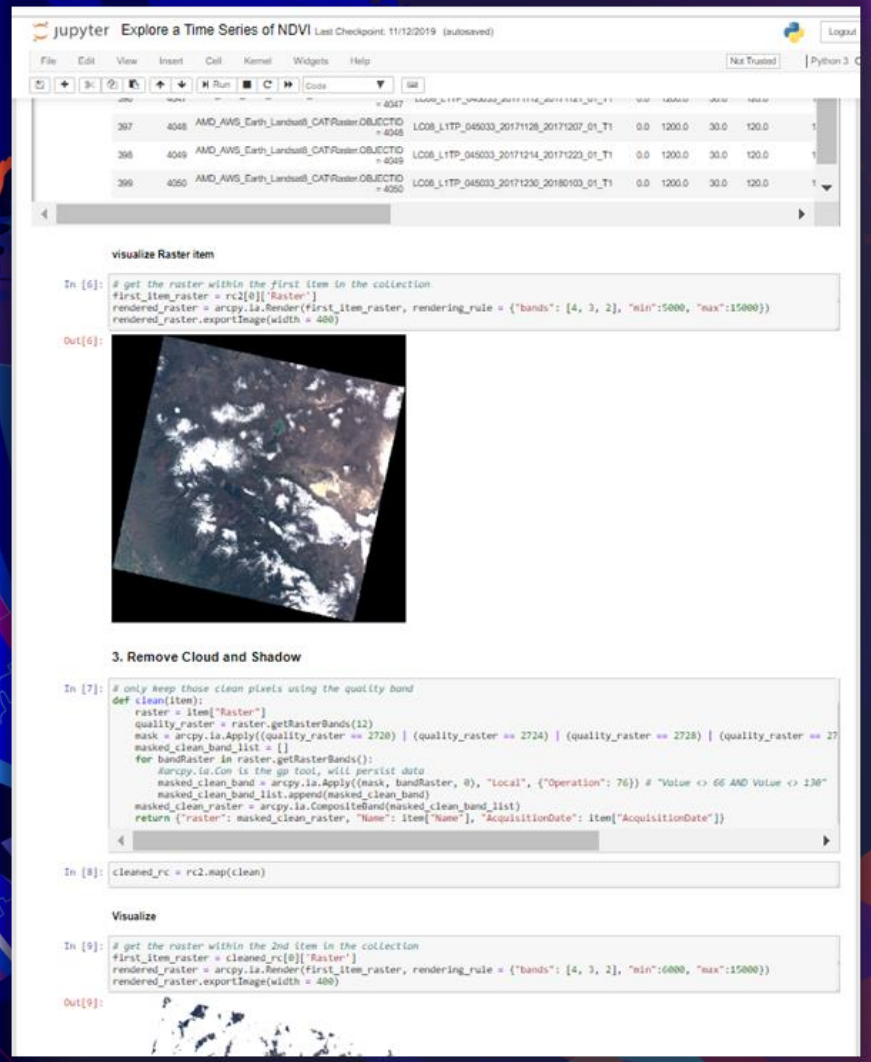
Statistics

FocalStats

Correction

ApparentReflectance
Geometric
RadarCalibration
S1RadiometricCalibration
S1ThermalNoiseRemoval





Demo – arcpy.ia module

Explore NDVI data through time

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