



WHAT IS OBJECT-BASED IMAGE ANALYSIS?

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PIXELS vs OBJECTS

Traditional pixel-based classifiers operate on a per-pixel basis, without regard for their neighboring pixels.



Object-based classifiers consider the spatial relationship among pixels and group similar pixels into **objects**, which are then classified as a whole.

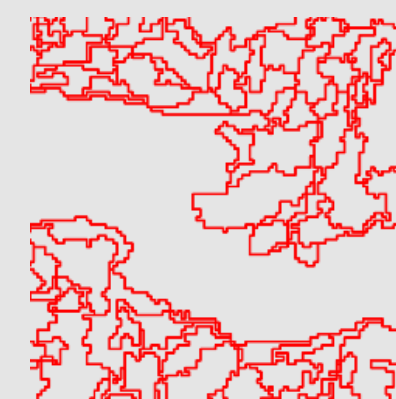
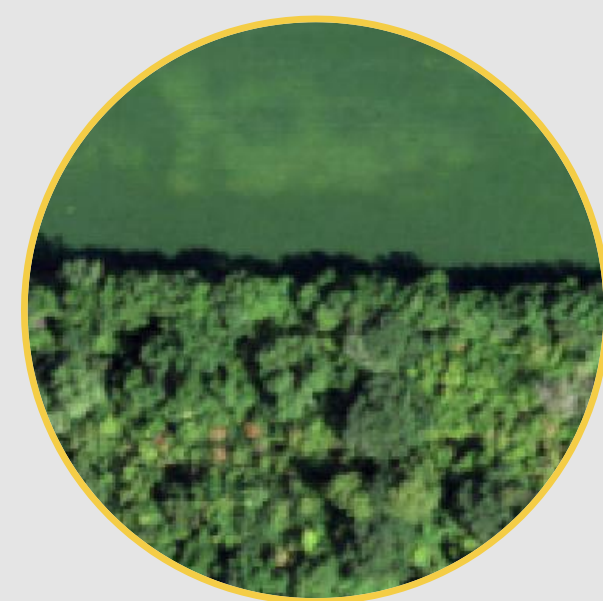


IMAGE OBJECT PROPERTIES



Texture

Tree canopy can be differentiated from other vegetation, such as crops, by its rough texture.



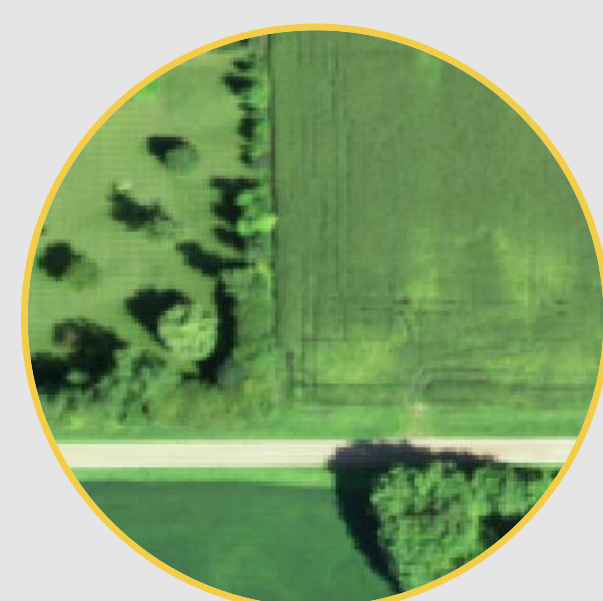
Geometry

Linear features, such as roads and buildings, can be extracted by their shape, size, and length characteristics.



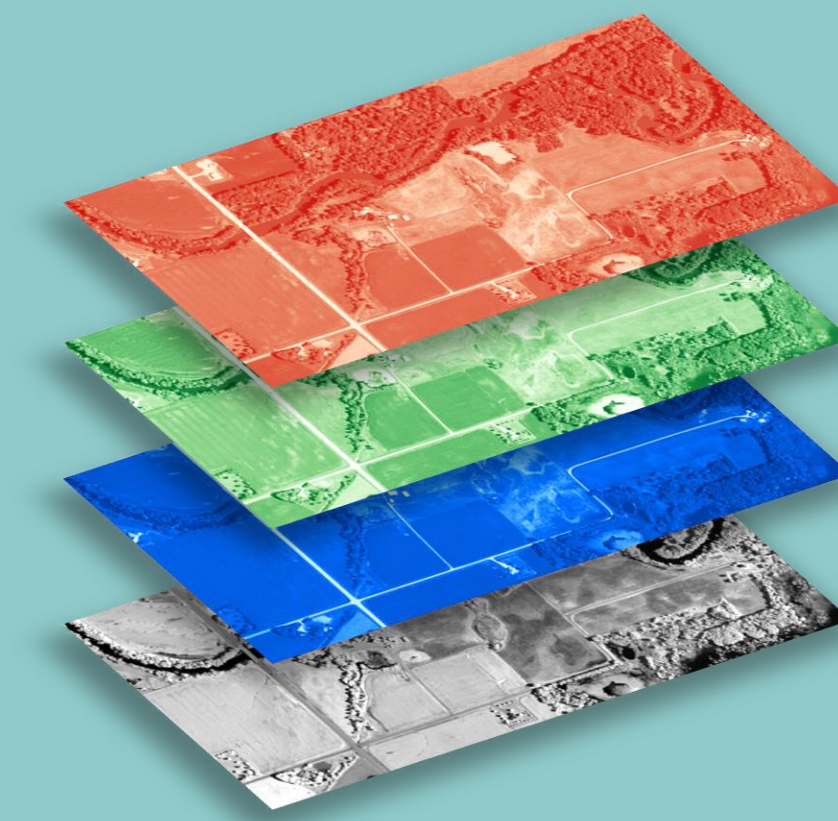
Spectra

Water absorbs near-infrared wavelengths, whereas healthy vegetation reflects them.



Context

Shadows can be identified by their proximity to tall features, such as trees or buildings.



THE ADVANTAGE

Object-based image analysis (OBIA) offers a customizable, semi-automated approach to classifying imagery, ultimately resulting in improved accuracy.

INPUT DATA

OBIA supports a diversity of data sources, including both raster and vector formats containing either continuous or categorical data.

- **Multispectral Imagery (bands)**
ex: blue, green, red, red edge, near infrared
- **Elevation and Height**
ex: DEM, point cloud (lidar, photogrammetry)
- **Vector Data**
ex: hydrology, roads, building footprints
- **Derived Data**
ex: NDVI (veg index), nDSM (height)

SEGMENTATION

= the process of grouping similar pixels into homogenous objects

Can be done iteratively, across the entire image, or on a classified subset of the image for fine-tuning. User dictates how certain parameters will influence the segmentation and resulting objects.

- **Size of Objects**
What level of detail is sought? Are you targeting individual trees or the entire forest?
- **Shape of Objects**
Is it more important to honor the input data's properties or to produce compact objects?

CLASSIFICATION

= performed on each image object as a whole, rather than its constituent pixels

Some examples:

- **Trees** — where nDSM (height) is > 2 meters with large deviation in NDVI values (texture)
- **Water** — where NIR (near infrared) is low
- **Roads** — where length/width ratio is high
- **Buildings** — where nDSM is > 2 meters with high 'rectangular fit'

