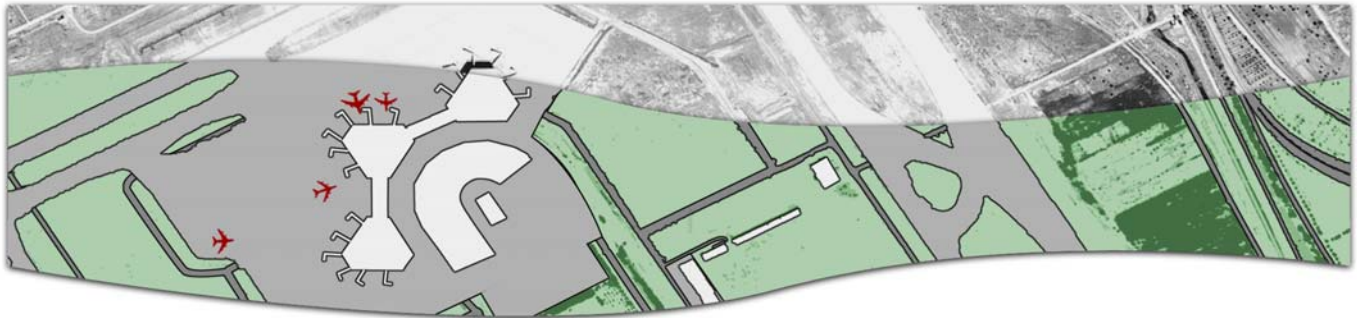
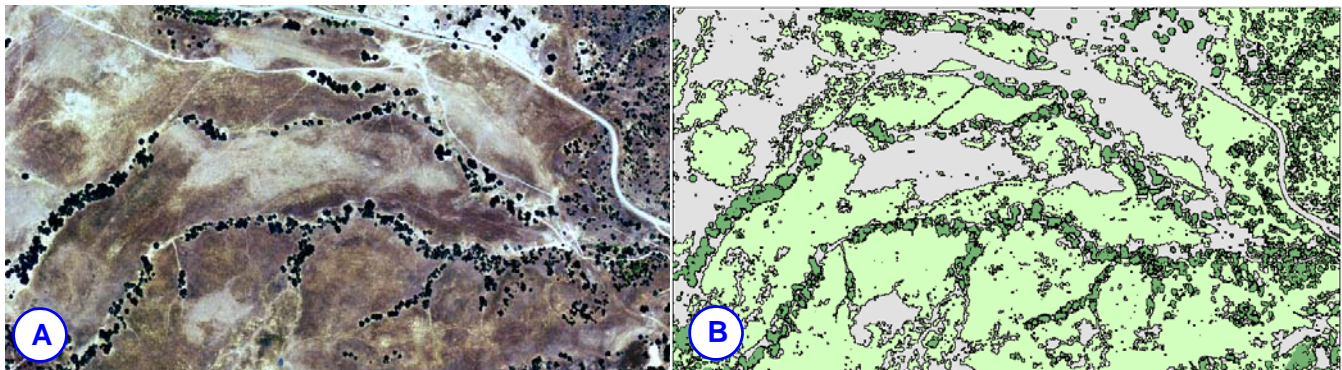


Feature Analyst® QuickStart GUIDE



UNSUPERVISED LEARNING *4.2 for ArcGIS*

Unsupervised Classification allows you to extract image information without providing training examples. You determine the number of classes and the unsupervised classifier assigns pixels with similar spectral characteristics to the classes.



Original image (A) and unsupervised three-class classification results (B)

The Feature Analyst unsupervised learning algorithm assigns pixels to classes based on similar spectral characteristics. Unsupervised learning can be useful when you have a limited knowledge of the area of interest in an image. Unsupervised learning only requires that you specify how many classes to search for in the data and set parameters for separating distance and variation.

Visual Learning Systems, Inc.

We put the Information in GIS



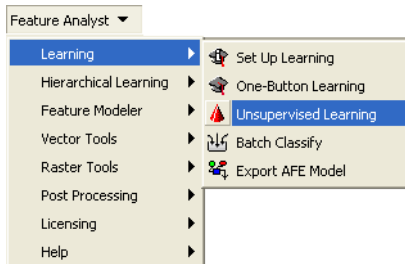
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Run an Unsupervised Learning Pass

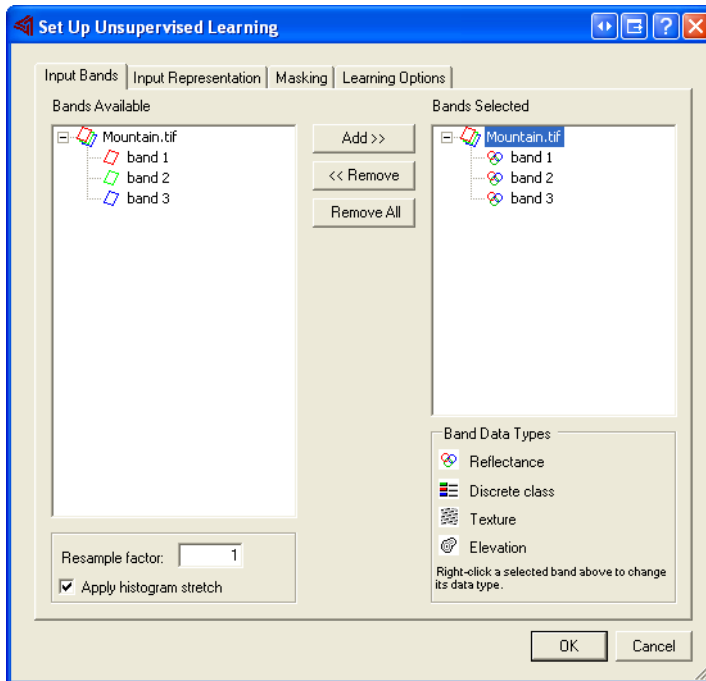
You can run an extraction pass without building a training set by simply identifying the number of classes within the image and allowing the unsupervised classifier to determine the best way to distinguish between classes when segmenting the entire image.

TO SET UNSUPERVISED LEARNING PARAMETERS

- 1 Load **the image** in the table of contents.
- 2 Choose **Feature Analyst** on the toolbar, choose **Learning** on the drop-down menu, and then choose **Unsupervised Learning**.



The Set Up Unsupervised Learning dialog box opens on the Input Bands tab.



Feature Analyst displays the bands associated with the images loaded in the table of contents in the Bands Available list box and automatically enters the bands associated with the top image displaying in the workspace in the Bands Selected list box.

By default, the band data type for all selected bands is set to Reflectance.

Note: The type of Feature Analyst license you have determines how many bands can be used in your extraction; a standard license allows a maximum of four bands and a professional license allows unlimited bands.

3 Accept the default band selection in the Bands Selected list box.

-or -

Choose **Add** and/or **Remove** to change the bands that will be used in the extraction.

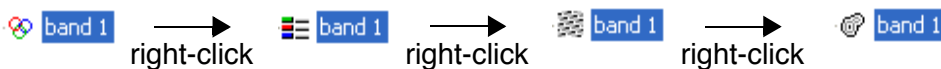
When you select Add or Remove the bands move from one list box to the other.

4 Accept the Reflectance Data Type.

-or-

Select a **band** in the Bands Selected list box and right-click to change the data type for that band to one of the three other options, Discrete Class, Texture, or Elevation.

Continue right-clicking to cycle through the four data-type options.



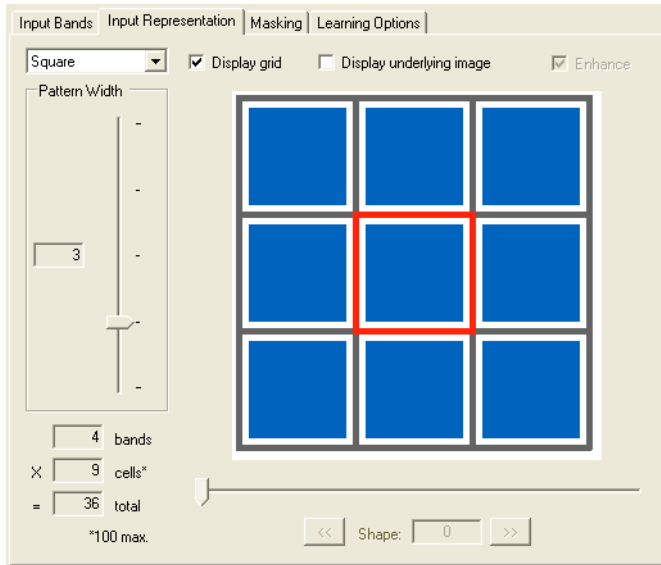
5 Accept the default resample factor value of 1 (indicating no resample), or enter a **resample factor** in the Resample Factor field according to the following:

OPTION	FUNCTION
<p>Resample Factor</p> <p>Resample factor: <input type="text" value="1"/></p>	<p>Determines the reduction or “increase” in resolution. For example, a resample factor of 4 will return 1 pixel for every 4 x 4 square pixel area.</p> <p>The default value is 1 (indicating no resample, since a resample factor of 1 will return 1 pixel for every 1 x 1 square pixel area).</p> <p>Valid resample factors are .25 to 10.</p> <p>NOTE: High resolution imagery often needs to be resampled for extracting land-cover. Experiment with a cropped image or a region of interest to determine the best resampling/input representation combination.</p>

6 Select or clear the **Apply Histogram Stretch** option according to the following:

OPTION	FUNCTION
<p>Apply Histogram Stretch</p> <p><input type="checkbox"/> Apply histogram stretch</p>	<p>Select to increase the contrast in the image and enable the learning model to perform better on images with poor contrast.</p> <p>Select for most extractions.</p> <p>Clear this option when extracting features from scanned maps.</p>

7 Select the **Input Representation** tab.



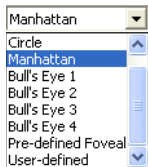
The Input Representation pattern and width are preselected by default.

Feature Analyst displays the number of bands (in the Bands Selected list box on the Input bands tab) in the Bands field.

8 Accept the default Input Representation pattern.

-or-

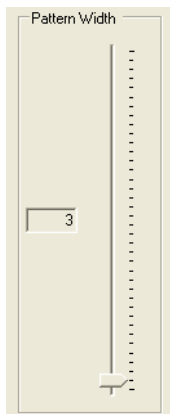
Select a different **Input Representation pattern** in the drop-down list box.



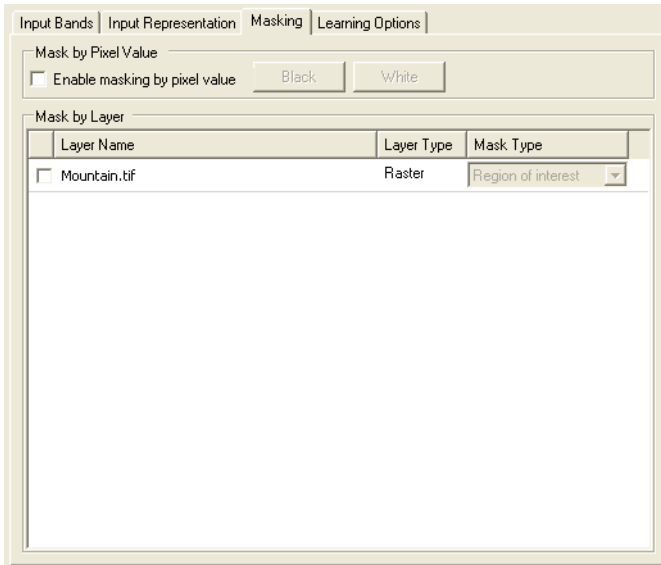
9 Accept the default Pattern Width.

-or-

Select a different **Pattern Width** using the slider.

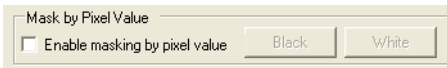


10 Select the **Masking** tab.

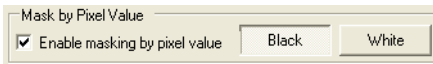


Feature Analyst displays all the active layers in the table of contents in the Mask by Layer list box.

11 To mask by black or white pixels, select or clear **Enable masking by pixel value**.



When selected, the Black and White option buttons become available.

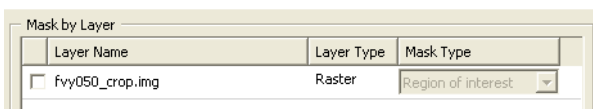


To mask out all pixels with a value of black (RGB 0,0,0), choose **Black**

-or-

To mask out all pixels with a value of white (RGB 255,255,255), choose **White**.

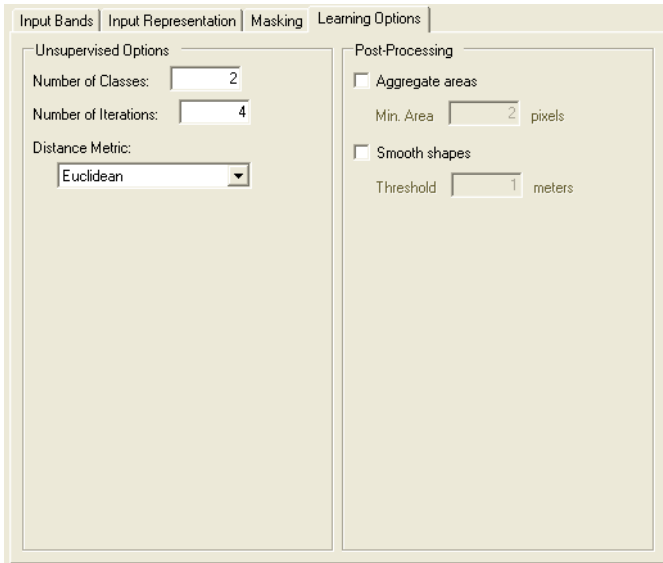
12 To mask using a layer, select **one or more layers** under Mask by Layer.



The list box in the Mask Type column for each selected layer becomes available.

Select a **Mask Type**, either **Region of interest** or **Region to exclude**, for each selected layer in the adjacent drop-down list boxes.

13 Select the **Unsupervised Learning Options** tab.



14 In the Number of Classes field under Unsupervised Options, enter the **number of classes** to create.

-and-

In the Number of Iterations field, enter the **number of iterations** to run.

Refer to the descriptions below, as needed.

OPTION	FUNCTION
Unsupervised Options	
Number of Classes	<p>Determines how many classes into which you want to divide the image. For best results, enter a number larger than the actual number of classes in the image.</p> <p>The default number is 2.</p>
Number of Iterations	<p>The number of times you want Feature Analyst to run an analysis of the image.</p> <p>Increasing the number of iterations will often improve results, especially on more complex imagery.</p> <p>NOTE: Increasing the number of iterations increases processing time.</p> <p>The default number is 4.</p>

15 In the Distance Metric field, select a **distance option** after reviewing the following descriptions:

OPTION	FUNCTION
Distance Metric	
Euclidean	Assigns a given pixel to a cluster with the closest (most similar) mean spectral value when grouping pixels into similar classes. The default selection.
Correlation	Assigns pixels based on hue and saturation values and ignores intensity values when grouping pixels into similar classes. This metric works well if you are extracting roof tops, for example, that are partially shadowed and partially unshadowed. Although the intensity values of the shaded and unshaded areas are markedly different, the hue and intensity are similar.

16 Under Post-Processing, select or clear **Aggregate areas**.

If Aggregate Areas is selected, the Min. Area field becomes available.

-and-

If you select Aggregate Areas, enter **the minimum number** of pixels to aggregate in the Min. Area field.

Refer to the descriptions below for assistance.

OPTION	FUNCTION
Learning Options	
Aggregate areas	Select to eliminate feature polygon clusters or fill spaces in feature polygons that are smaller than the number of pixels entered in the associated Min. Area field.
Min.Area	The default Min.Area value is 2 pixels.

17 Select or clear the **Smooth shapes** option.

If Smooth shapes is selected, the Threshold field becomes available.

-and-

If you select Smooth Shapes, enter **the threshold** for smoothing in the Threshold field.

Refer to the descriptions below for assistance.

OPTION	FUNCTION
Learning Options	
Smooth shapes	Select to smooth in the learning process (rather than as a separate post-process) to reduce vertices between class boundaries.
Threshold	Runs a Stair Step Removal smooth based on pixel size. The default threshold is 1 meter.

18 Choose **OK**.

The Save Feature As dialog box opens.

By default, Feature Analyst names the file in the Name field using the last file name, the process (in this case Uns, for Unsupervised), and incremental numbering.

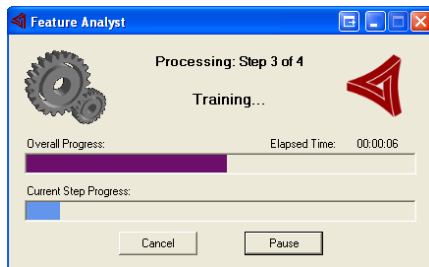
19 Accept the **default file name** and **file location**.

-or-

Provide a **new name** and **location** for the file.

20 Choose **Save**.

The Feature Analyst process displays the progress of the unsupervised classification.



The new feature class created during the unsupervised extraction process appears in the table of contents with each feature class identified.



21 Review the results.

22 To fine-tune results, you can use Split Out Classes to split out the feature classes and then run Hierarchical Learning or Post Processing on each.