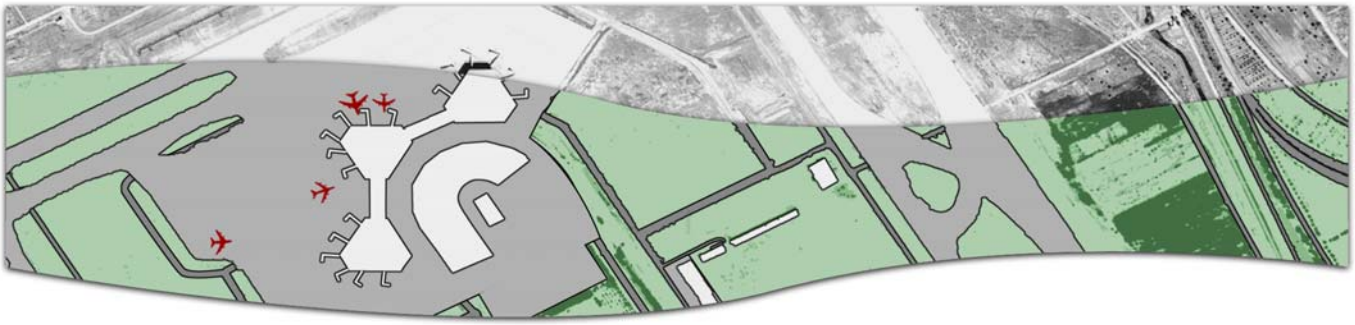
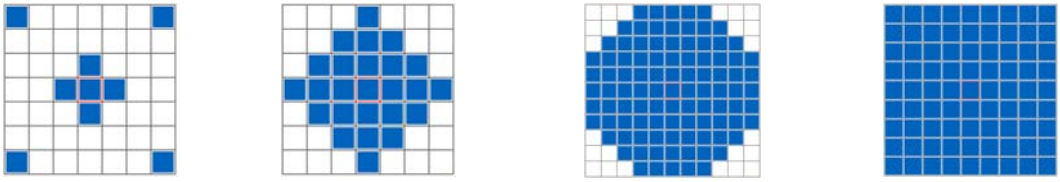
Feature Analyst® QuickStart GUIDE



4.2 for ***ArcGIS***

THE INPUT REPRESENTATION

Surrounding information, or spatial context, assists the Feature Analyst Learner in distinguishing one feature from another. To take into account spatial context, the Learner uses an Input Representation.The Input Representation is the pattern used to classify each pixel in your image to determine if it is part of the target feature. The input representation determines the shape and size of the *window* through which Feature Analyst will look to gather information for each pixel. This is how Feature Analyst distinguishes between rivers and lakes, roads and parking lots, and other features with similar spectral signatures.



During the training phase of the extraction process, Feature Analyst positions the center cell of the selected input representation pattern over each of the defined training pixels and records the spectral information (for all image bands) associated with each pixel that can be *seen* with the pattern. Once all the information about the training pixels has been gathered, Feature Analyst creates a learning profile, which defines the characteristics of the target feature class. Feature Analyst then positions the center cell of the selected input representation pattern over each pixel in the image and, using the learning profile, looks for pixels similar to the training pixels. If the pixel information for the pixels under the input representation pattern matches the learning profile, then the target pixel (the pixel located under the pattern's center cell) is classified as feature class. If the pixel information does not match, the target pixel is classified as background.

Visual Learning Systems, Inc.

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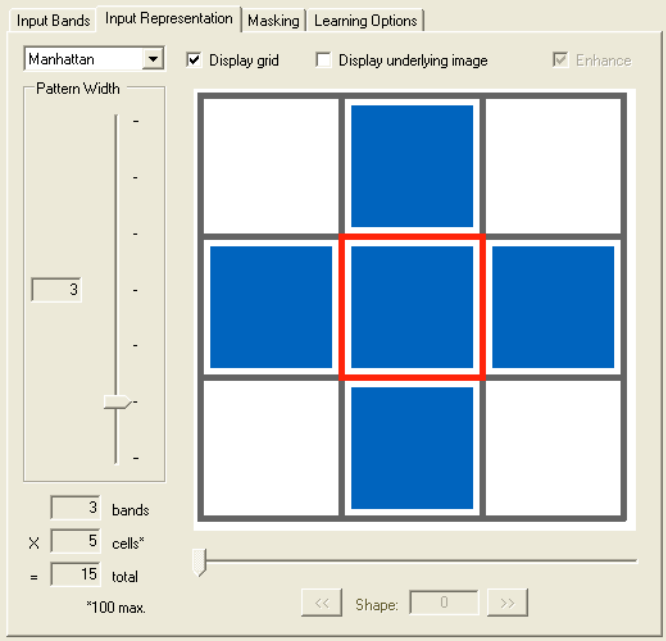
The Input Representation Tab

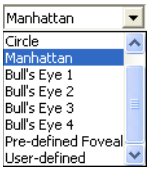
On the Input Representation tab of the Set Up Learning dialog box, you can select the best Input Representation pattern and width for your target feature. There are eight pre-defined patterns and one user-defined pattern. You can preview your image underlying each potential Input Representation before making your final selection.



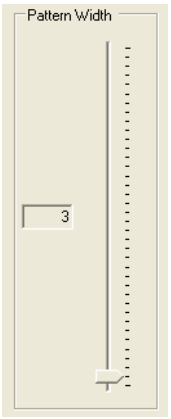
The Input Representation tab on the Set Up Learning dialog box

Select an Input Representation

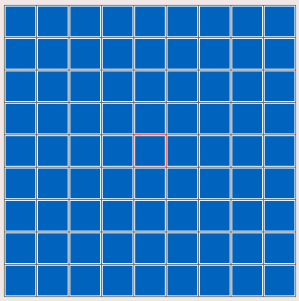
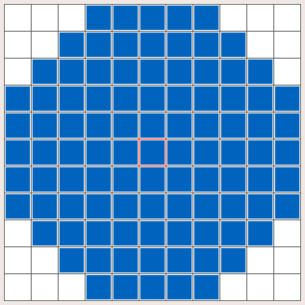
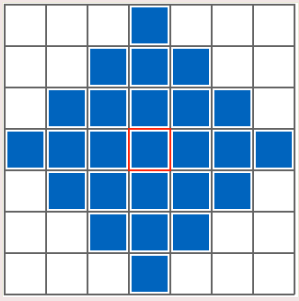
1 On the Set Up Learning dialog box, choose Advanced, select the Input Representation tab, and then select an Input Representation pattern in the drop-down list box.

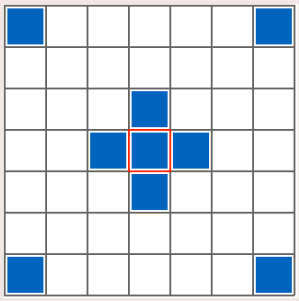
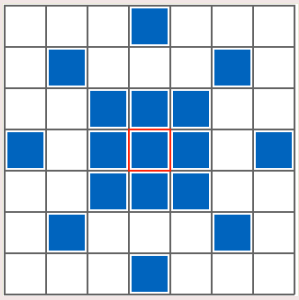
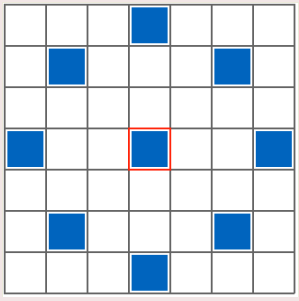
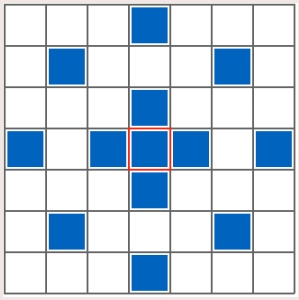


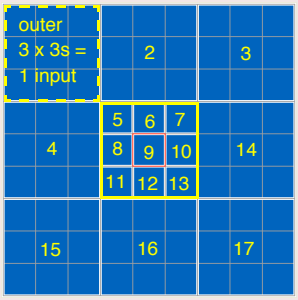
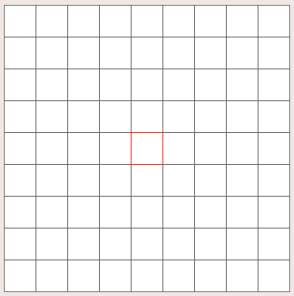
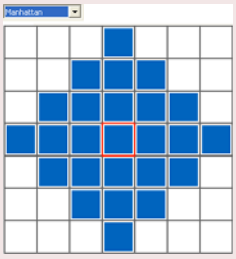
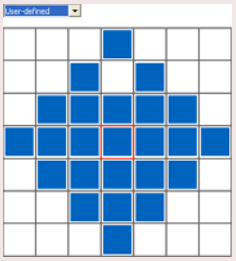
2 Select **a Pattern Width** using the slider.



Use the input representation pattern descriptions that follow for assistance.

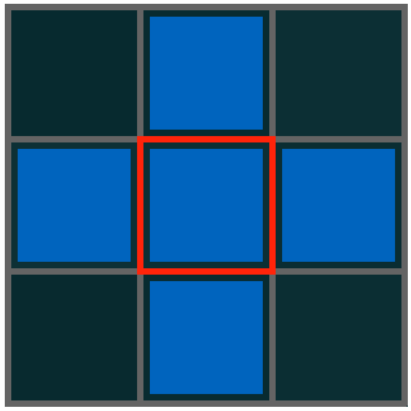
OPTION	FUNCTION
Select an input representation that fits the target feature and provides the best search pattern.	
Square  Pattern Width 7	A square pattern is good for square-type features, such as buildings. Pattern width can be set for any odd increment of pixels from 1 to 9. NOTE: Using a solid pattern to find individual features can increase processing time, since enlarging the pattern width to extend beyond the center point of the target feature greatly increases the number of pixels in the input.
Circle  Pattern Width 7	Use for land-cover type features to determine boundaries between relatively large classes. Use also to find isolated points such as individual trees, etc. Pattern width can be set for any odd increment of pixels from 1 to 11. NOTE: Using a solid pattern to find individual features can increase processing time, since enlarging the pattern width to extend beyond the center point of the target feature greatly increases the number of pixels in the input.
Manhattan*  Pattern Width 7	Use this general purpose pattern for large, land-cover features, such as vegetation, wetlands, and impermeable surfaces; block-type features, such as commercial or residential buildings; and water mass features, such as oceans, lakes, and flooded areas. In general, start with a Manhattan 5 for buildings and a Manhattan 3 for Lakes and Vegetation. Pattern width can be set for any odd increment of pixels from 1 to 13. NOTE: Using a solid pattern to find individual features can increase processing time, since enlarging the pattern width to extend beyond the center point of the target feature greatly increases the number of pixels in the input.

OPTION	FUNCTION
Bull's Eye	As a general guideline, use Bull's Eye patterns for long, linear objects, such as roads and rivers.
Bull's Eye 1*  Pattern Width 7	Use this pattern for small man-made features of less than 5 meters, such as telephone poles and manhole covers, and for narrow linear features of less than 10 meters, such as sidewalks and streams. Pattern width can be set for any odd increment of pixels from 1 to 75. NOTE: Using a Bull's Eye can reduce processing time by keeping the number of pixels in the input low. Since this representation skips the intermediate pixels between the center point of the target feature and the pixels on the outer edges, the pattern can be effectively increased to go well beyond the center point of the target feature without using a large number of pixels in the input.
Bull's Eye 2*  Pattern Width 7	Use this pattern for wide linear features greater than 10 meters, such as streets, freeways, rivers, and man-made features greater than 5 meters, such as parking lots and swimming pools. Pattern width can be set for any odd increment of pixels from 1 to 75. NOTE: Using a Bull's Eye can reduce processing time by keeping the number of pixels in the input low. Since this representation skips the intermediate pixels between the center point of the target feature and the pixels on the outer edges, the pattern can be effectively increased to go well beyond the center point of the target feature without using a large number of pixels in the input.
Bull's Eye 3*  Pattern Width 7	Use this pattern for natural features such as trees and shrubs. Pattern width can be set for any odd increment of pixels from 1 to 75. The center of this pattern changes as the width is increased. NOTE: Using a Bull's Eye can reduce processing time by keeping the number of pixels in the input low. Since this representation skips the intermediate pixels between the center point of the target feature and the pixels on the outer edges, the pattern can be effectively increased to go well beyond the center point of the target feature without using a large number of pixels in the input.
Bull's Eye 4  Pattern Width 7	Use for individual features such as single trees, and for linear features such as roads, paths, etc. Pattern width can be set for any odd increment of pixels from 1 to 75. The center of this pattern changes as the width is increased. NOTE: Using a Bull's Eye can reduce processing time by keeping the number of pixels in the input low. Since this representation skips the intermediate pixels between the center point of the target feature and the pixels on the outer edges, the pattern can be effectively increased to go well beyond the center point of the target feature without using a large number of pixels in the input.

OPTION	FUNCTION
Pre-defined Foveal  Pattern Width 9* *A 9 x 9 pixel Foveal provides only 17 inputs to the Learner, with each outer 3 x 3 pixel region providing a single input derived from the average of the 9 pixels. Widening the pattern to 27 provides 25 inputs to the Learner.	Select this pattern to concentrate on the center pixels while taking into account the gist of the outer pixels. A good pattern to use when extracting targets from cluttered scenes. The Learner is given a region with high spatial resolution at the center (where the prediction is made) and lower spatial resolution away from the center, providing contextual spatial information to the Learner with a reduced number of pixels. Pattern width can be set for any odd increment of pixels from 1 to 81.
User-defined 	Select this pattern to create your own input pattern. Pattern width can be set for any odd increment of pixels from 1 to 75. You can also select one of the other 8 patterns first, and then modify that pattern by clicking on a cell(s) to add/delete from the pattern. As soon as you change the selected input representation pattern, the pattern name in the list box changes to User-defined.  

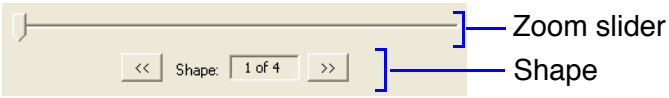
3 For visual assistance in selecting the best pattern for the features you want to extract, select **Display underlying image**.

The image appears in the Pattern Viewer with the center of the selected pattern located at the center of your first training example. The digitized training example does not display.



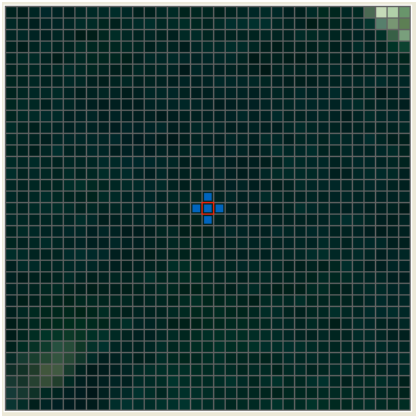
The Enhance option next to Display underlying image becomes available.

The Zoom slider and Shape field below the Pattern Viewer become available.



The Shape field displays the number of the training example currently displaying in the viewer with the total number of training examples in the training set.

4 Using the Zoom slider, **zoom out** (move the slider to the right) for a better view of the underlying image.



5 Clear the **Display grid** option, as necessary, to improve visualization of the underlying image.

6 Select the **Enhance** option, as necessary, to improve the contrast, for viewing purposes only, of the underlying image.

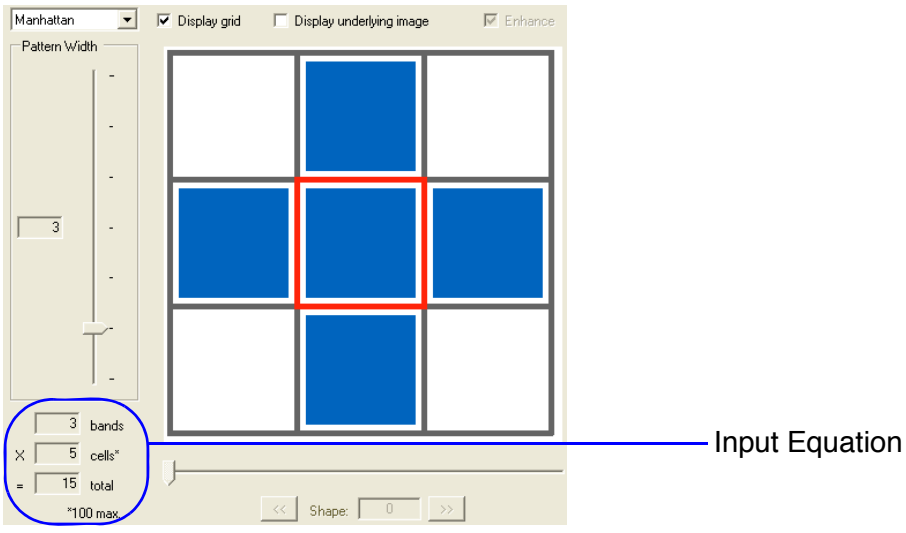
Tip: Right-click and drag on the image in the Pattern Viewer to pan.

For accurate viewing, the display of the underlying image reflects the Resample Factor entered on the Input Bands tab.

The same example with no resample (A), a resample factor of 2 (B), and a resample factor of 4(C)

7 Use the arrow buttons to the right and the left of the Shape field to view the selected input representation pattern centered on each of your training examples to verify that you have selected the best pattern for the training set features you want to extract.

8 Review the values in the Input Equation for the selected Input Representation Pattern and Width.



The maximum number of pixels that Feature Analyst can include in one pattern view is 100. For example, a Manhattan-3 pattern contains 5 pixels. The maximum size for the Manhattan pattern is 13, which contains 85 pixels, since a Manhattan-15 would include 113 pixels and exceed the limit.

9 Note the **Total** number of inputs in the Input Equation.

Total refers to the number of inputs that will be processed for every pixel in your image (excluding those that you mask out). The larger the number of inputs the longer the processing time. To reduce processing time, keep the number of inputs as low as possible without compromising your Input Representation.