



EXERCISE 4

Classification for Tree/Non-Tree

Introduction

Traditional methods of classification typically use a pixel-based algorithm. eCognition provides methods for creating object-based classification processes. The major steps are: set up an image segmentation process, create a classification scheme, assign feature values to use in the model to predict and assign land cover, create samples of each land cover category to train the classification model (standard nearest neighbor), train and apply the model to all segments, and evaluate results (repeat if necessary). Finally, we will further classify some of the tree land cover objects as single trees based on a threshold value of the elliptic fit (a measure of each object's roundness).

Objectives

- Learn to do simple classifications in eCognition
- Build a rule set to classify imagery into Tree and Non-tree classes

Required Data

- The high-resolution (1 meter) image: **naip_2007_5band.img** (the NDVI layer was created using ERDAS Imagine and was appended to the image layer stack).
- The rule set file: **tree_nontree_rule_set.dcp**

Prerequisites

- You have unzipped and extracted the course material
- You have completed Exercises 1, 2, and 3 or have basic familiarity with eCognition
- You have eCognition Developer open with an empty canvas





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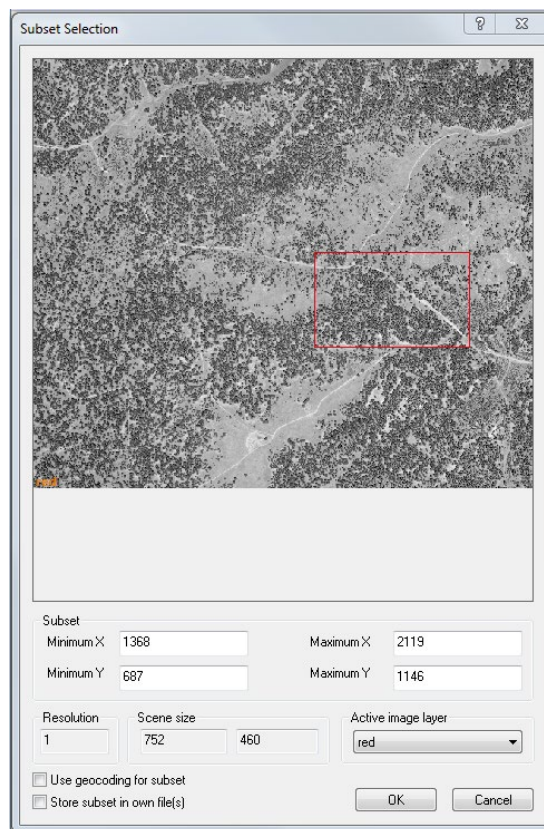


Part 1: Project Setup and Load Rule Set

In this part of the exercise, you will open and set up a new project and load a rule set which has one process defined and which you will add to, in order to create your classification.

A. Project Setup

1. If not already open, Launch eCognition Developer in Rule Set Mode.
2. From **File**, select **New Project**.
3. In Import Image Layers window, navigate to the location of the course data, and select the **naip_2007_5band.img** image and click **Ok**.
4. Name the project **Tree_NonTree**.
5. Set the **Image Layer Aliases** to the following:
 - i. Layer 1 = red
 - ii. Layer 2 = green
 - iii. Layer 3 = blue
 - iv. Layer 4 = NIR
 - v. Layer 5 = NDVI
6. Click the **Subset selection** button and select a small region of the image (similar to the following graphic).



7. Click **Ok** to close the **Create Project** dialog and apply the settings.
8. Change your **View Settings** (if you haven't already) to the **Develop Rulesets** view.

B. Load Rule Set

1. **Right-click** in the **Process Tree** window and select **Load Rule Set**.
2. Navigate to the course data and locate the **tree_nontree_rule_set.dcp**.
 - i. You will notice that the rule set has one parent process ("**Create Segments**") with one child process. Since the last exercise covered the steps required to developing the segmentation process, we have provided you with a prepared rule set for this step in the exercise.
 - ii. Take a moment and explore the child process (Hint: either double-click on it or right-click on it and choose Edit).
 - (a) The **8 [shape:0.1 compact.:0.7] creating 'New Level'** is the actual segmentation process. The Algorithm Parameters for this step allow you to give different weights to the image layers and change the scale, shape and compactness parameters which drive the shape and size of the segments.
 - (b) In the next Part of this Exercise, you will run the segmentation process from this rule set.

Part 2: Segment the Image

You will now run the segmentation process and briefly evaluate your results prior to building on to your rule set in Part 3 of this exercise.

A. Execute the Create Segments Process

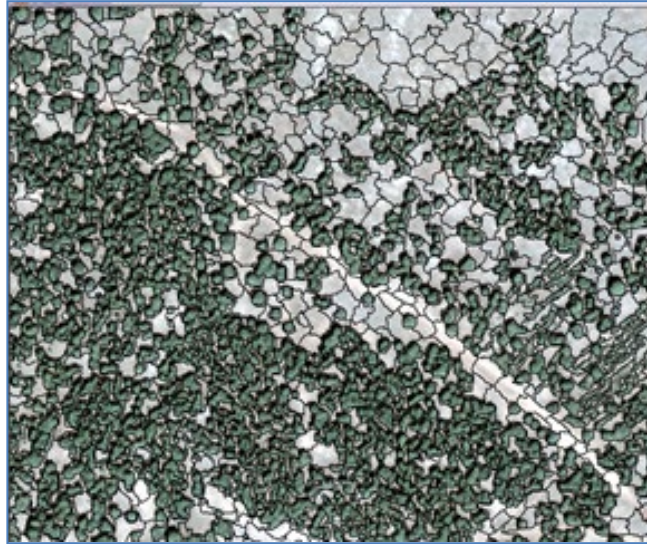
1. From the **Process tree**, right-click on the Parent process called '**Create Segments**' and select **Execute**. This will execute all child processes, including the actual segmentation process.

Note: You have the option to execute any child process individually in the rule set.

B. Evaluate the Segments

Now we need to create the other 6 stratification classes using two separate conditional statements.

1. Use the scroll wheel on your mouse or the plus and minus buttons on the main menu to **zoom** in and out to visually evaluate the segments.
2. Also use the **pan-hand** to pan around the image and **inspect** the segments. Keep in mind, the goal is to distinguish trees (or groups of trees) from non-tree areas (see following graphic).



Do the segments effectively delineate trees or groups of trees from the surrounding landscape (primarily sparse grassland)?

C. Add features to Image Object Information

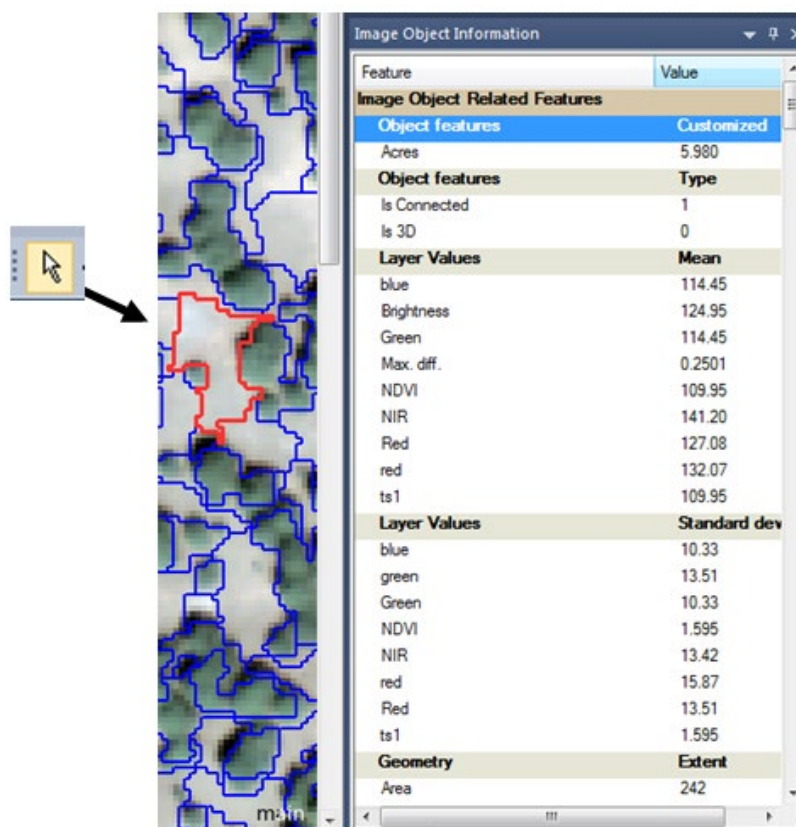
1. Let's add some helpful feature information to the section titled **Image Object Information**. This section is typically found beneath the Process Tree, and allows the user to select some feature values to display in this area for informative purposes. Users can select a plethora of information. Today we will make sure that the scene related features and the object features are displayed.

Question: What are the object features? What are the scene related features?

Answer: In eCognition an image object attribute is referred to as a **feature**. Features represent a source of information concerning image objects (page 126, [Definiens 2007](#)), and include (but are not limited) to characteristics in these general categories:

1. Color/tone of a single image object (mean of the pixels that comprise the image object)
2. Shape
3. Texture
4. Information on the classification
5. Association or how the image objects relate to other image objects in their neighborhood

2. **Right-click** in the **Image Object Information** window and choose **Select Features to Display...**
 - i. From the left hand side (Available) **double-click Object features** to add all of them to the Selected side.
 - ii. Click **OK**.
3. Now check if it works. Select the **Normal Cursor** (the white arrow) and then click on a segment in the map. The Image Object Information window will now populate with all the attributes associated with this segment.



D. Change the View

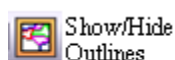
There are many different view settings to choose from once you have segments (and later classifications) created; these can be confusing, so we will take a moment to test out some of the different views and try to get a handle of how to navigate them (see following graphic). The next page illustrates the utility of these.



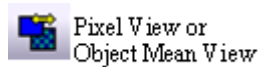
This group of buttons allows you to select image view options, offering views of the segments, classification, and any features (from the Feature View options) that you wish to visualize.

This group of buttons allows you to select to display the outlines and borders of image objects and views of pixels.

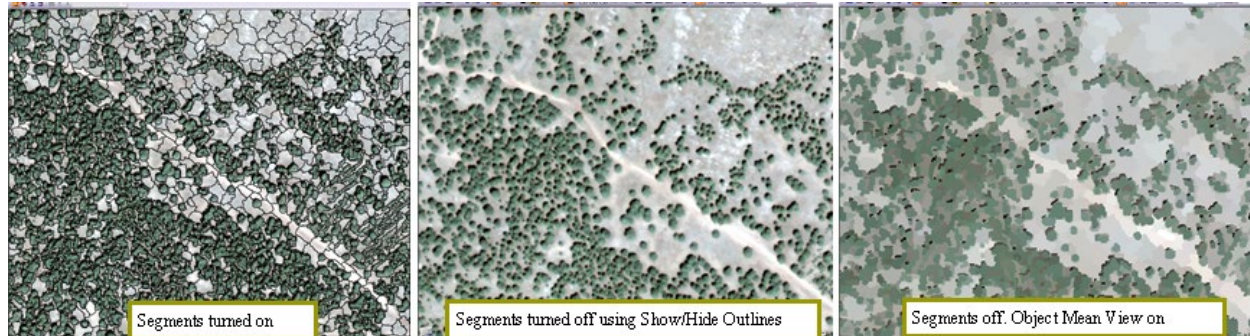
1. Click the **Show or Hide Outlines** button (see following graphics) to turn the segments on and off. This is a button you will probably use quite often.



2. With the segments turned off, click the **Pixel View or Object Mean View** button (see following graphics) to view the data in **Object Mean** mode.



- i. **Object Mean View** colors objects (aka segments) according to the average value of all the contributing pixels from currently displayed bands, within that object/segment - thus displaying everything within that object as a single, solid color, or average color.



3. In the map use your **Normal cursor** to select a single segment/object. In the **Image Object Information** window you will notice that the Object feature information is updated with the information about that segment. Each object has a “Mean” value for each of the Layers (or bands) that are selected in the image layer mixing panel (button shown below). These values are what the **Object Mean View** is using to colorize the image (see the red box in the following graphic).

Image Object Information

Feature	Value
Image Object Related Features	
Object features	Customized
Acres	5.980
Object features	Type
Is Connected	1
Is 3D	0
Layer Values	
blue	114.45
Brightness	124.95
Green	114.45
Max. diff.	0.2501
NDVI	109.95
NIR	141.20
Red	127.08
red	132.07
ts1	109.95
Layer Values	
blue	10.33

Composition of homogeneity c...

Shape 0.1

Compactness 0.7

Feature View

No cla

Vector features

Object features

Customized

Type

Layer Values

Mean

Brightness

Green

Max. diff.

NDVI

NIR

Red

blue

green

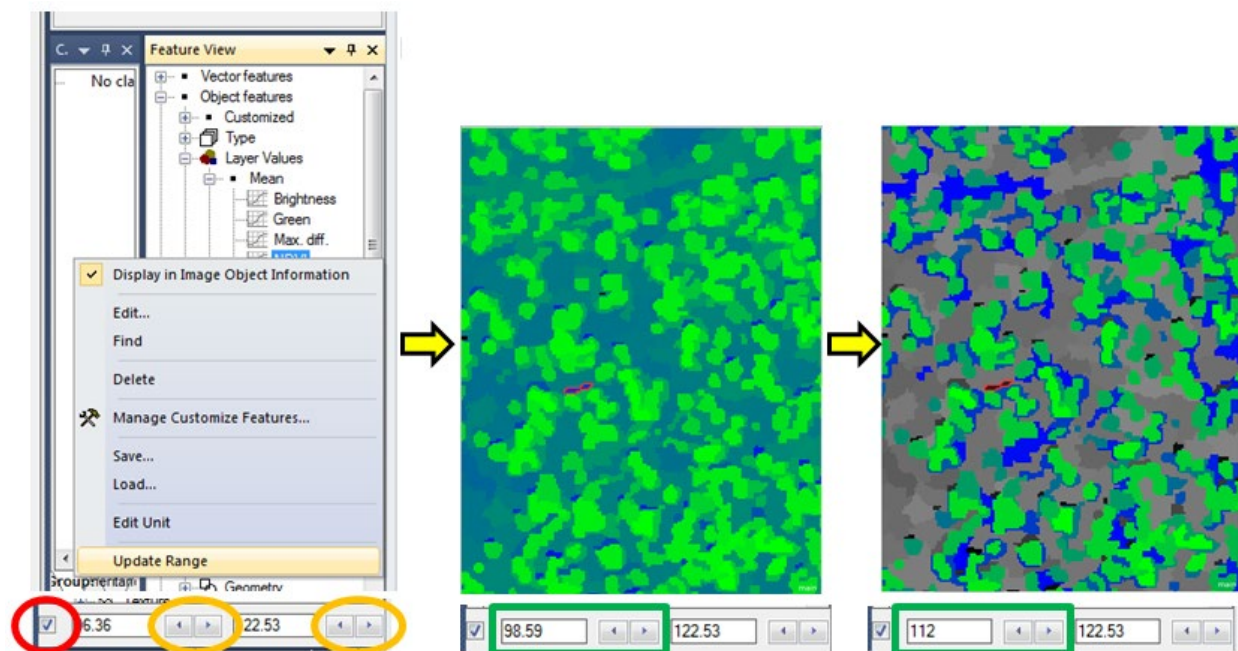
red

ts1

Mode

You can also use the Feature View panel (yellow box in image above) to populate the image with the object values of any object/segment characteristic.

4. For example, set the display to the mean NDVI value of each object.
 - i. In the Feature View panel, **right click** on the **Mean NDVI** option (housed within the object features, then Layer Values, then Mean).
 - ii. Select **Update Range**.
 - iii. Then at the bottom of the Feature View panel **check** the small box next to the two text boxes (red circle in image below).
 - (a) Now the text boxes are populated with the min and max values of the specified object feature (mean NDVI). The map display will be populated with the mean NDVI value—with higher values are displayed in shades of blue and lower are displayed in shades of green.
 - iv. Test where there are thresholds between object groups (tree segments vs. grass segments) by **clicking on the arrows** next to the text boxes (orange circles in image below). Notice that adjusting these values will turn the color off segments that are outside the specified boundaries (green boxes in image below).
 - v. Reset the min and max values by **Updating the Range** once again in the Feature View panel.



5. If you like, **repeat** step 4 to display objects/segments by **Area** (found under Object features, Geometry, then Extent).
6. Next turn the **Segments** back on by clicking the **Show/Hide Outlines** button.
7. Then select **View Layer** (button shown below) to see the imagery once again.



8. You might find these various view options helpful when visualizing your data, segment results and classification results. The utility of the different view options will become more apparent when you begin generating and evaluating classifications. Save your Project
9. Save your project in your working directory. Name it something like **grass_tree_classification.dpr**.

Part 3: Create and Run the Classification Process

The next step is to create the classification process. This includes creating a **Class Hierarchy** (not technically a process, but necessary unless you load in a shapefile of sample data). Then you will create the **Classification** process.

A. Create Class Hierarchy

1. In the **Class Hierarchy** window right-click and select **Insert Class** from the menu.
 - i. The **Class Description** dialog opens. This dialog allows the user to create a new class, and to set the classification description and parameters for how classes will be classified. For example, in the pane at the bottom of this dialog, under the tab that says “**All**”, users can enter an expression to use a **Standard Nearest Neighbor** type of classification and select which image layers will be used for classification.
2. In the **Name** pane, type “**Ground**” and select a shade of brown/tan from the color dropdown to the right.
3. Click **Ok**.
4. **Repeat** these steps (1-3) for the class “**Tree**” and set the color to a shade of green.
5. Once more, repeat these steps for the class “**Single Tree**” and set the color to red.

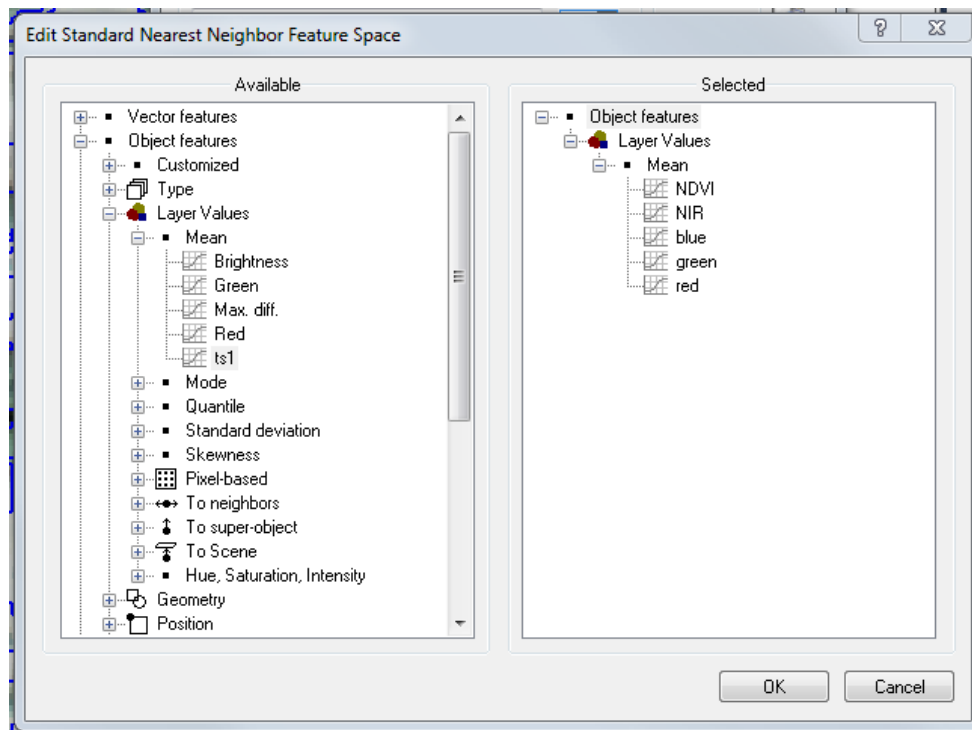
B. Set classification to Standard Nearest Neighbor

1. **Right-click** on one of the classes in your **Class Hierarchy** and select **Edit** to reopen the **Class Description** dialog.
2. **Double-click** on the words “**and (min)**” under the **All** tab to open the **Insert Expression** dialog.
3. Double click the **Standard nearest neighbor** option and you will see it added to the **Class Description** in the **All** tab, and the **Contained** tab.
 - i. An optional approach to classifying the Tree/Non-tree would be to use a simple NDVI threshold and the Assign Class algorithm. To see these steps, please refer to the Appendix.
4. Click **Close** to exit the **Insert Expression** dialog. You may notice that there are no object features which the Standard nearest neighbor will generate the classification from. We need to add some object features, such as the mean NDVI value of each object/segment.
5. To do this, **double-click** on the **Standard nearest neighbor** expression.
6. In the **Edit Standard Nearest Neighbor Feature Space** dialog, you will see two windows side-by-side called “**Available**” and “**Selected**”. The contents of the “**Selected**” window indicate which features have been included for the classification.
7. In the **Available** window, click the plus sign to expand the **Object** features. Within this, expand the **Layer Values** and finally, expand the **Mean** group.

8. Double click to add each of the layers to the **Selected** window: **NIR, blue, green, red and NDVI**.

***Hint:** To remove (or add) layers to and from the Available and Selected panes, you simply double click them. There are often other features that assist in classifying land cover types, such as the standard deviation of the Layer Values.*

9. Before closing the dialog, ensure your **Edit Standard Nearest Neighbor Feature Space** looks similar to the following graphic, then click **OK** to apply the settings and close the dialog.



10. Click **OK** again to close the **Class Description** dialog.
11. Repeat steps 1-4 for the other two classes in your Class Hierarchy. You will notice that when you double-click to add the Standard nearest neighbor process that the spectral bands you selected already for the first class automatically come in with the process.

C. Select Training Data

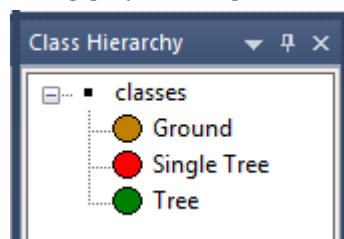
Now that we have defined our Classes and the way in which they will be classified, our next step is to collect training samples from the segments for the Ground and Tree classes. We are not going to try and classify the Single Trees using the spectral method we are using for the Ground and Tree classes. We will separate out the Single Trees in a later step using shape characteristics to define a single tree from the Tree land cover category.

1. Bring up the **Samples** toolbar by clicking on **View** in the main menu, and locating the **Toolbars**, then **Samples**.
 - i. If necessary, **dock** it with your other toolbars.

2. **Turn off** segments using the **Show/Hide Outlines** button. Turning the segments off will make it easier to visualize the various segments you are going to select as training data (this will become more apparent once you try it out).
3. To **select** training samples (double-click segments which represent your various classes), you need to have the **“Select Sample”** button selected (shown outlined in red in the following graphic).



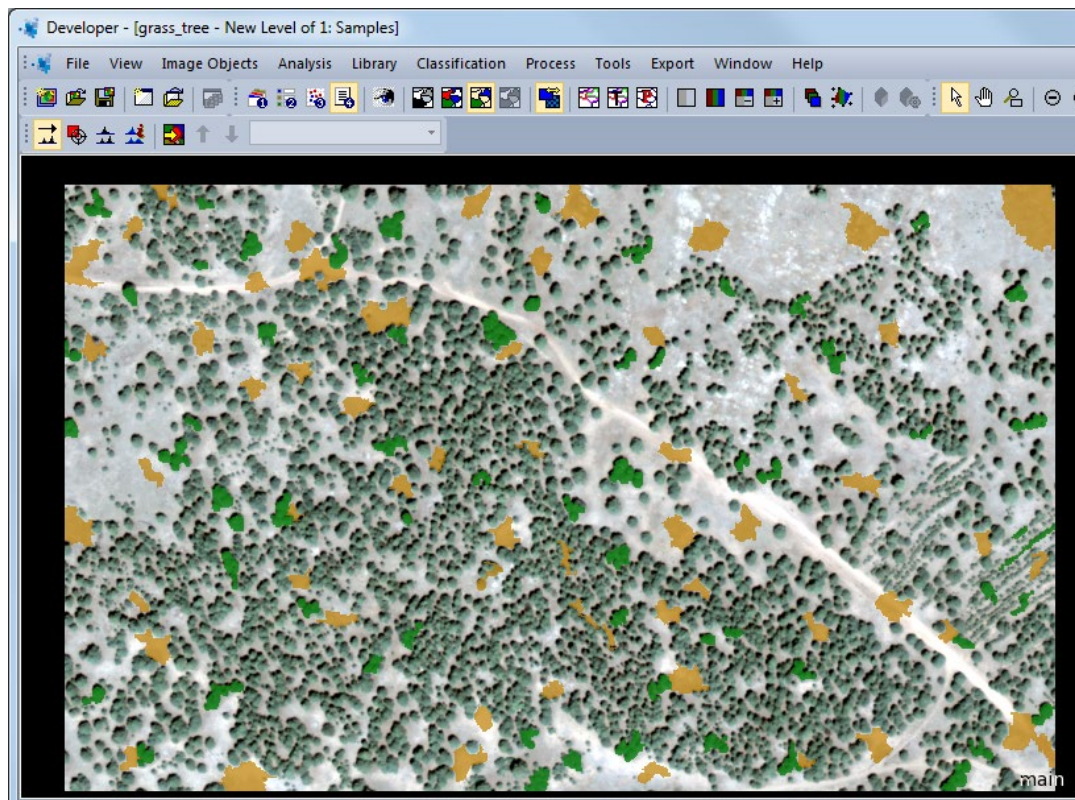
4. To begin selecting training data for a particular class you must **first highlight** the class in the **Class Hierarchy** window (see following graphic). Begin with the **Ground** class.



5. With the **Ground** class highlighted and the **Select Sample** button activated, begin collecting training data for the **Ground** class by **double-clicking** areas that represent ground.

Hint: *Double-click a training sample to unselect it. You can also click once on an area, and it will outline the segment in red—you can assess it before double clicking to select it as training data.*

- i. Make sure you are comprehensive in your training sample selection. Collect samples that capture the variation in the ground class, making sure to grab small and large, bright and dark, and samples that are located in the tight spaces between trees and throughout the whole image. See the following graphic for an example of training samples for both the **Ground Class** and **Tree Class**.

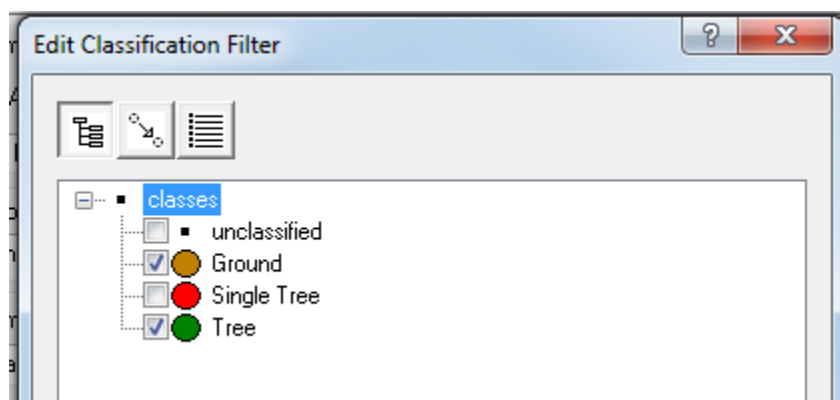


6. Next, **change** the class you are collecting training for by highlighting, in the **Class Hierarchy** section, the **Tree** class.
7. Repeat the steps for selecting training data for the **Tree** class. Ensure the **Select Sample** button is active and begin double-clicking segments to select them as training for the Tree class.

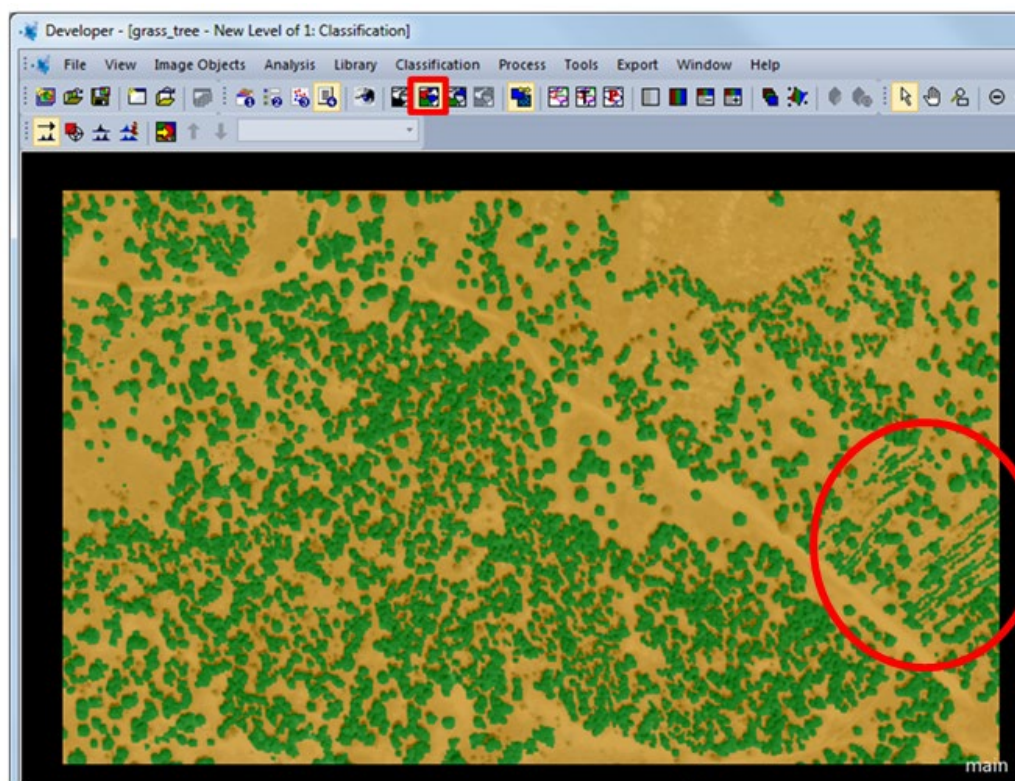
Note: Again, be sure to collect a comprehensive sample, including small and large groups of trees, individual trees, linear strips of trees, and trees from every part of the image.

D. Append New Parent and Child, Classification Process

1. In the **Process Tree**, right-click on the **Create Segments** process and select **Append New**.
2. In the **Edit Process** window, name the process **Classify**. Leave the rest of the defaults and click **OK**.
3. Next, **right-click** on the parent process you just created and select **Insert Child**.
4. Now add the Classification process from the **Edit Process** window. In the Algorithm menu, choose **Classification** (housed under the Basic Classification grouping).
5. Under the **Algorithm Parameters** section change the **Active Classes** option from "none" to **Ground** and **Tree** by clicking the empty pane and the **three dots "..."** to open the **Edit Classification** filter dialog that allows you to check the two classes (see following graphic).

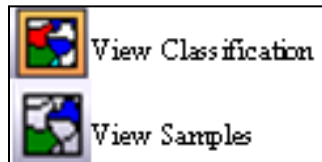


6. Click **OK** to close the **Edit Classification Filter** window.
7. Click **Execute** in the main **Edit Process** window to run the process.
8. Turn on the **View Classification** setting to view the results (see red box in image below). The output from your classification should look similar to the following graphic—the trees (both single and groups) are shown in green, and the interspace areas (e.g. herbaceous, bare ground) are shown in brown.
 - i. Also notice that there are some black areas – these are segments that didn't get classified. You can try adding samples that assign these shadowy areas a class. Then re-run the classification (see following graphic).



Note: If your classification did not pick up the thin strips of trees circled above, you will need to add more training samples for the Tree class to include a couple of these features and re-run the Child process from the Classify rule.

9. Now that you have a classification, try changing the View by clicking between the **View Classification** and **View Samples** buttons on the main menu bar—the View Classification button is on the left and the View Samples on the right (see following graphic).



10. If you decide you need to add some more Samples for either of the Classes and need to run the Classification process again, you will want to switch your view to **View Samples** and collect the additional training data.
 - i. You will need to **Delete** the old classification result before running the classification process again. To do this, right-click the Ground class and select **Delete Classification**. Repeat for the Tree class. Then re-execute the classification process after you have created new/additional samples (see following graphic).

Alternatively, you can add a “delete classification” child process just above the Classification process (both housed within the Classify parent process).

1. Right click on the Classify parent process and select **insert child**.
2. Select **remove classification** (from the Basic Classification grouping).
3. Finally, **Execute** this process to remove your existing classification.
4. Now you are ready to re-run the **classification** process.

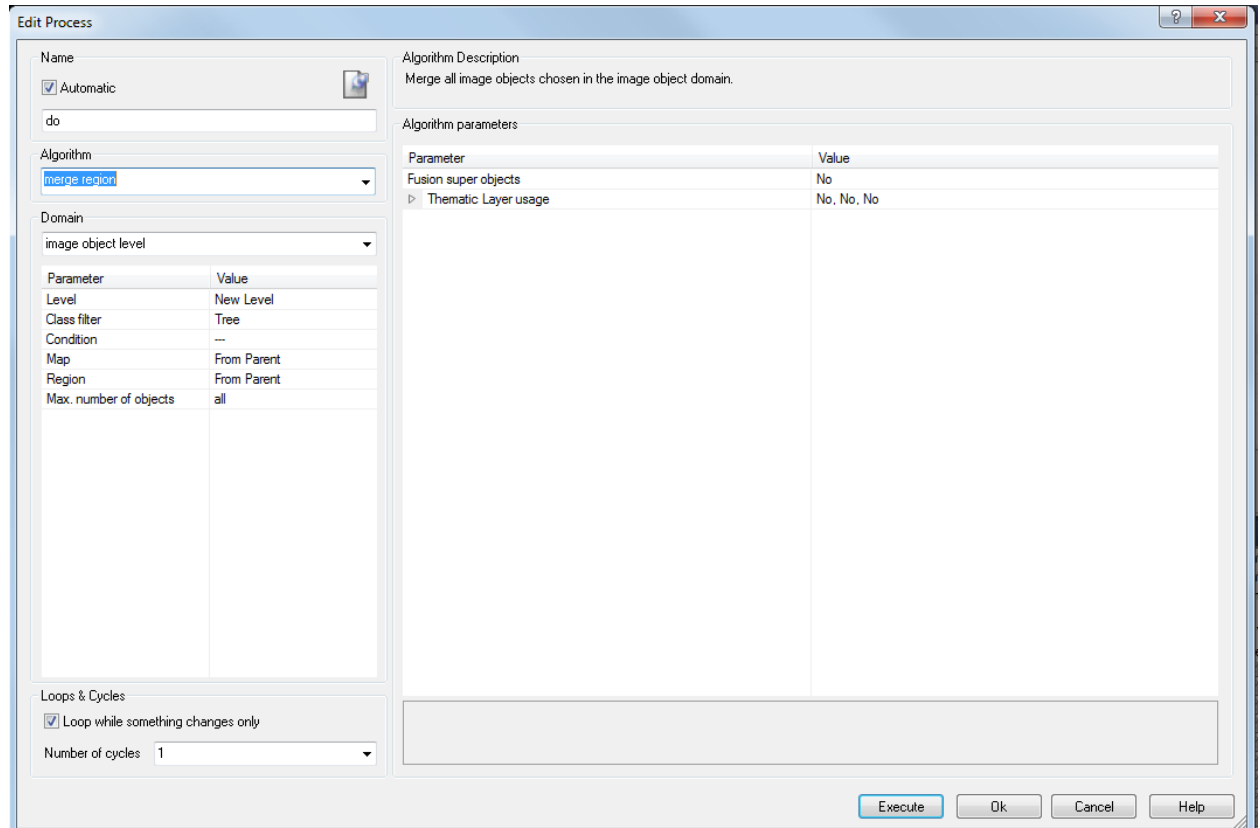
Part 4: Create and Run the Merge Process

Once you have a Ground/Tree classification that you are satisfied with, you are ready to create a merged dataset from those classes. This will make the process of selecting individual trees, from groups of trees, possible using shape characteristics of the objects.

A. Append new Parent and Child Processes, Merge Objects

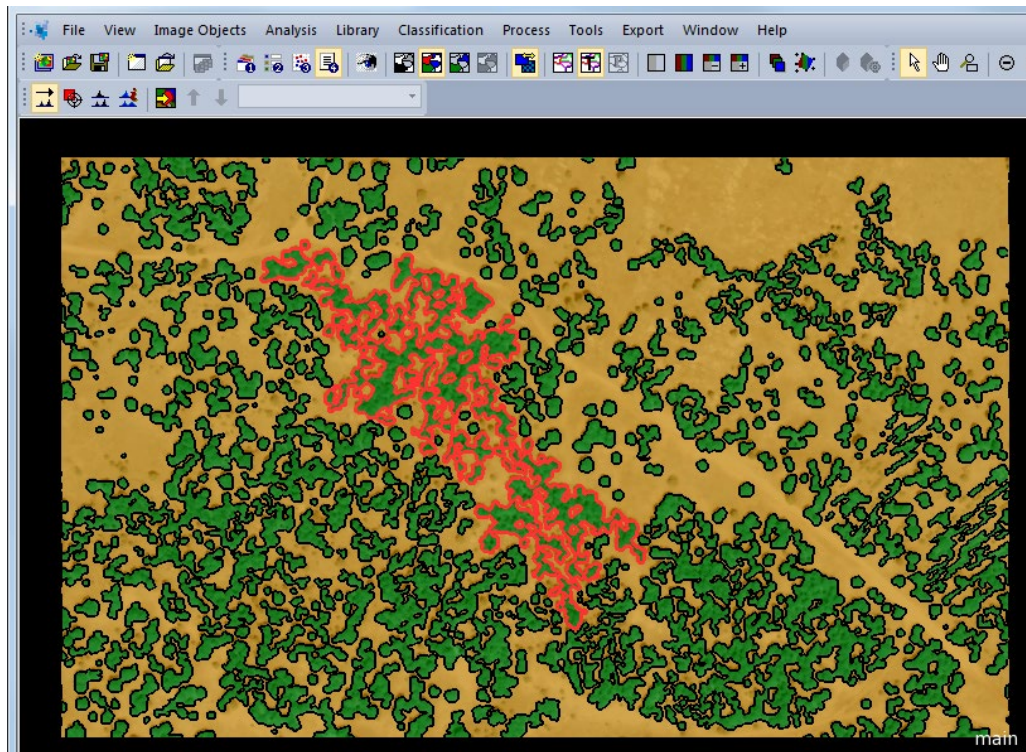
1. In the **Process Tree** section, single click on the **Classify** Parent process (just to highlight it), then **right click** and select **Append New**. You are appending a new Parent Process (Merge) at the same level as the Classify Parent Process.
2. In the **Edit Process** dialog, name the Parent process as **Merge Objects**. Leave the defaults and click **OK** to save the edits.
3. Next, right click the **Merge Objects** process and select **Insert Child**.
4. In the **Edit Process** dialog, from the **Algorithm** menu locate **merge region** from the **Basic Object Reshaping** section (see following graphic).

- From the **Image Object Domain** area, locate the line that reads **Class filter** and click the line with 'none' to display the three dots "...". Click on the three dots to open the **Edit Classification Filter** dialog. Select **Tree** (see following graphic).



- Repeat steps 3-5 for the **Ground** class, creating a new merge object process for it.
- Once you have these two Child processes created, from the **Process Tree** right click on the **Merge Objects** parent process and select **Execute**.
- You can observe your handy work by setting the display such that **View Classification** and **Transparent/Non-transparent outlined objects** are activated. Then use the **Normal Cursor** and click on and highlight a part of the Image View. You will notice the segments that are adjacent to each other are now merged—see following graphics.





Part 5: Create and Run the Individual Process

In order to separate single trees from groups of trees, we will use the **Elliptical fit feature** of the objects to define single trees. Follow the steps below to help determine what defines a single tree based on the Elliptical fit feature.

A. Display Image Object Information

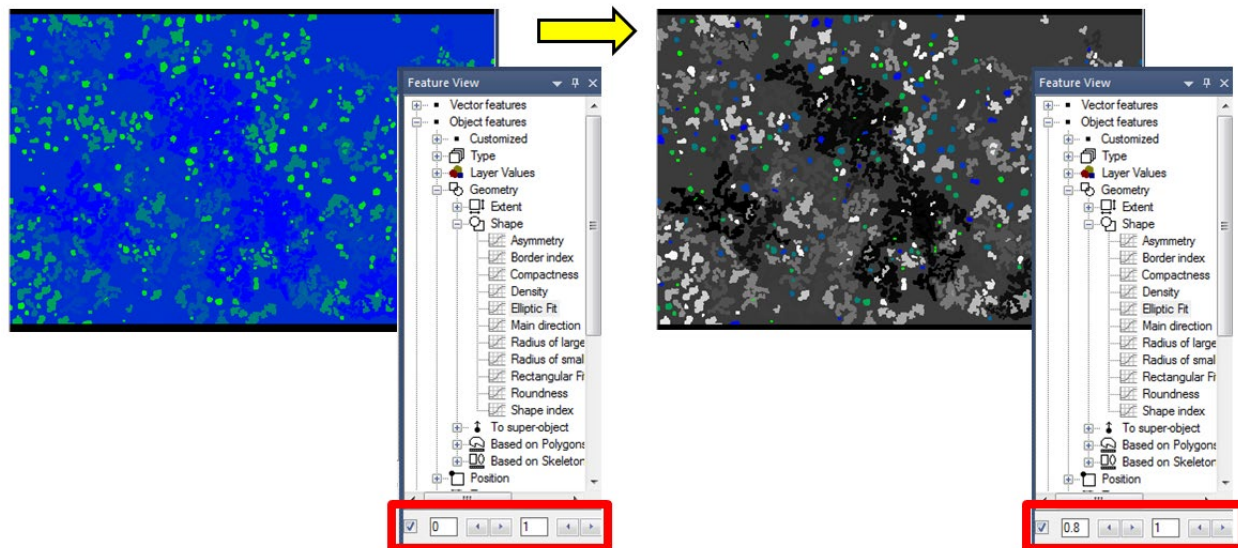
1. In the **Feature View** panel, navigate to **Object Features, Geometry, Shape**, and then **Elliptic Fit**. Right-click on **Elliptic Fit** and Select **Update Range**. Then check the min, max box at the bottom of the Feature View window to activate this feature (note, this will turn your display into a series of green and blue objects).
 - i. If the image objects/segments are still transparent, turn off the **Transparent/Non-transparent outlined objects**.



B. Evaluate Single Tree Objects

Next, you need to evaluate the single tree objects and their Elliptical Fit values.

1. In the min/max window at the bottom of the Feature View, adjust the values to determine a threshold (or “cut-off” value) for the **Elliptical Fit** that represents single trees. Increase the lower threshold until you find that most of the single trees are still highlighted in greens and blues, but all other features are excluded from the blue and green color scheme.
 - i. Hopefully you will determine that an **Elliptical Fit of .85 or greater** should capture the single trees.



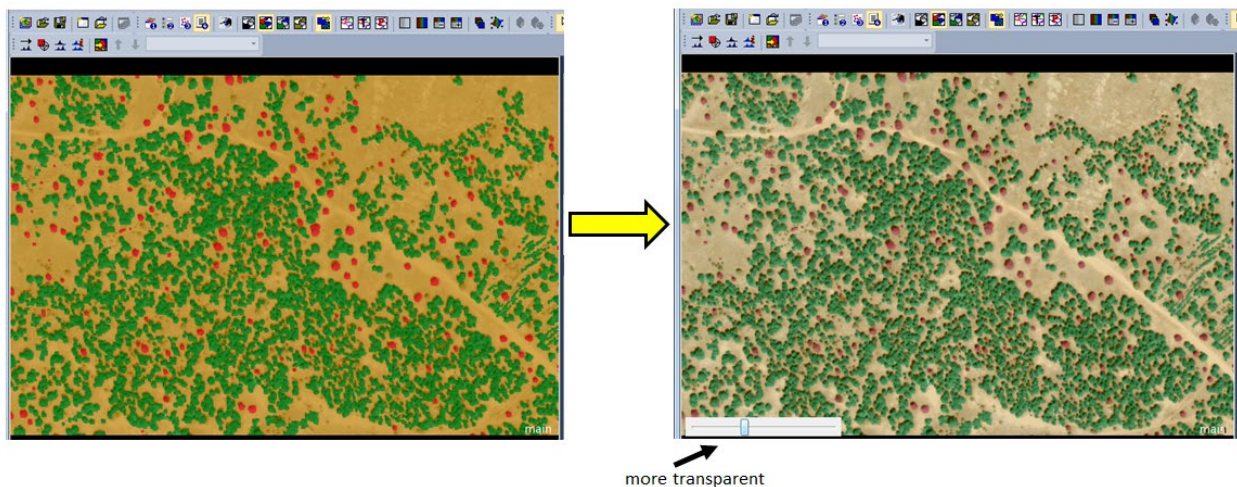
C. Append New Parent & Child, Single Tree Classification process

Now you will create a process that singles out the Single Trees.

1. In the **Process Tree** window right-click on the **Merge Objects** parent process and choose **Append New**.
2. In the **Edit Process** dialog name the Parent process **Classify Single Tree**, leave the defaults, and click **OK**.
3. Next, right-click on new parent process, Classify Single Tree, and select **Insert Child**.
 - i. From the **Algorithm** menu locate and select the **assign class** process.
 - ii. Apply a **Class filter** – set it to the **tree** category.
 - iii. Next, you need to set the (threshold) **Condition** for the Elliptical Fit. To do so, click the empty space next to **Condition** and then on the three dots “...” to open the **Edit condition** dialog.
 - (a) Click in the cell that aligns with the Value 1 column and the first Condition row. Use the drop down menu to select **From Feature...**
 - (b) In the new dialog box titled Select Single Feature, navigate to and **double-click** on the **Elliptic Fit** feature (under **Object Features, Geometry, Extent, then Shape**). This will return you to the Edit condition window.
 - (c) In the same row, use the drop down menu to change the Operator to **>=** (greater than or equal to).

- (d) Then update the Value 2 cell in the same row to the threshold value identified in the previous steps (**0.85**). Here you can just type in the cell instead of using the drop down menu.
- (e) Hit **OK** to exit the **Edit condition** dialog.
- iv. Over in the **Algorithm parameters** area, set the **Use class** from unclassified to **Single Tree**. This will assign any objects/segments that meet the conditions (is currently classified as Tree AND has an elliptic fit value greater than or equal to 0.85) to the single tree classification.
- v. Click **Execute** to run the process.
4. Activate the **View Classification**. You should notice that the single trees (color red) have been added to the map classification.
5. **Evaluate** your single tree classification.
 - i. You can **change the transparency** of the classification layer by locating the **Transparency button** in the lower left corner of the Image View.

Note: The Classification layer must be turned on in order for this button to show (see difference in following graphic).



6. **Save** your project before moving on.

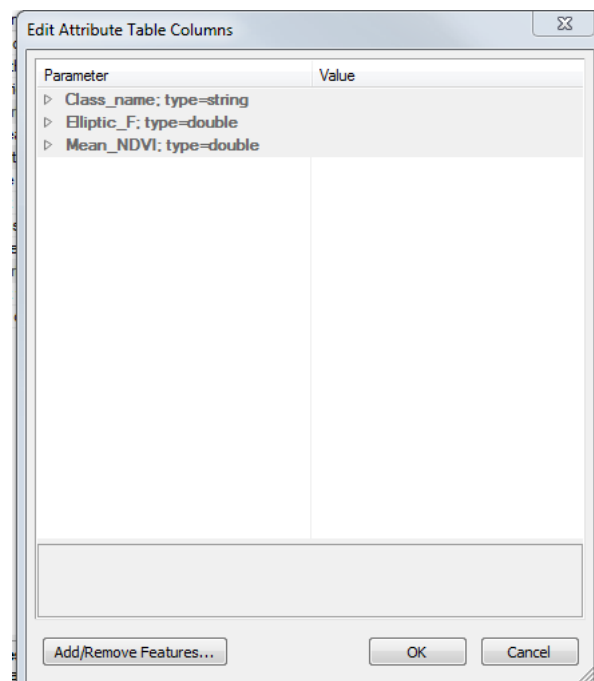
Part 6: Export Results

The last step of this exercise is to export your results from the classification process.

A. Set Export Options and Run

1. Right-click on the Classify Single Tree parent process and select **Append New**.
2. Modify the name to **Export Classification Results**. Leave all other default settings. Select **OK**.
3. Right-click on the Export process you just created and select **Insert Child**.
4. In the Edit Process dialog, select **export vector layer** as the Algorithm. From here you will change a few of the default options before exporting the results.

- i. Make sure the **Domain** is set to **Image Object Level**.
- ii. Leave the **Level** at **New Level** (this is the name of our Level of segments and classification—if you had many Levels you would choose here which to export).
- iii. Next, click on the ‘none’ in the box next to **Class filter**. Select the three dots to open the **Edit Classification Filter** dialog. From here you can select which classes you want to export. For this scenario, let’s only export tree-related classes. Double click **Single Tree** and **Tree**. Select **OK**.
- iv. Change the **Export Mode** to “Use explicit path” and define a specific path to export your segment shapefile to in **Export Path** (e.g., C:\eCognition\Projects\classification\tree_nontree_results.v1.shp). Add the file name as well (like you see in the path above).
- v. Add any **values** you would like to the **Attribute Table** by clicking on the **Click to edit attribute table**. Let’s add in the mean NDVI layer value, the elliptic fit, and the classification names.
 - (a) Expand and navigate to **Object Features, Layer Values, Mean** and double-click on the **NDVI** option to add it to the **Selected** side.
 - (b) Similarly, expand and navigate to **Object Features, Geometry, then Shape** and double-click the **Elliptic Fit** option to add it to the Selected side.
 - (c) Finally, expand and navigate to **Class-Related features, then Relations to Classification, then Class name**. Here double-click on the Create new ‘Class name’ option. Select OK in the new popup window. Then double-click on the newly added field, **Class name(0,0)** to add it to the Selected side of the dialog box.
 - (d) Select **OK**.
- vi. Next a dialog box opens where you can adjust the table column names. Leave the defaults and select **OK**.



Note: you can also adjust the features that you've selected by clicking on the Add/Remove Features.

- vii. Change the **Shape Type** to **Polygons**.
 - viii. Leave the default settings for **Export Type**, **Dimension**, and **Use geo-coded coordinates**.
 - ix. Make sure the **Export Format** is set to **Shapefile (*.shp)**.
 - x. Lastly, press **Execute**.
5. Last, go check the folder location for your export files.

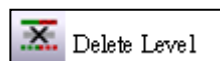
Part 7: Run Entire Process on Entire Image (optional)

Next we can run out full workflow on the full image – remember that we have been testing our rule set development on just a subset of our imagery.

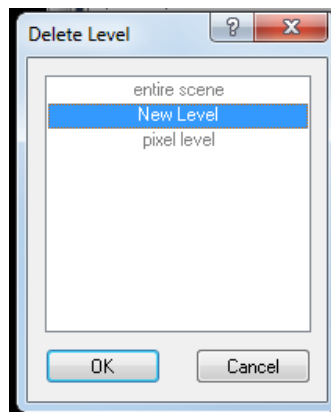
A. Delete Current Segments

Before we can re-run the process on the entire image, we need to remove our subset. First we must **delete** our current level (New Level) of segments because eCognition will not let you change the Subset if you have segments currently created.

1. From the main **menu area**, locate the **Delete Level** button—it is to the right of the zooming options (see following graphic).



2. Click it and in the **Delete Level** dialog (see following graphic), with "**New Level**" selected, click **OK** to delete the segments.



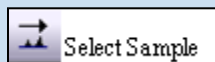
3. In message window that pops up about losing samples for the selected levels, click **Yes**.

Note: Next, you must recollect sample data for the Ground and the Tree classes—essentially you are going to repeat the steps of this entire exercise. You will have to **recreate** new samples for the entire image.

B. Remove subset and Re-Run

1. Now, **navigate** to **File**, then **Modify Open Project**.
2. In the **Modify Project** dialog, click the **Clear Subset** button. Then click **OK**.
3. Now **Execute** the **Create Segments** parent process (this may take a moment to finish running, it took my processor about 30 seconds to segment).
4. Next, you must recollect sample data for the Ground and the Tree classes—essentially you are going to repeat the steps of this entire exercise.

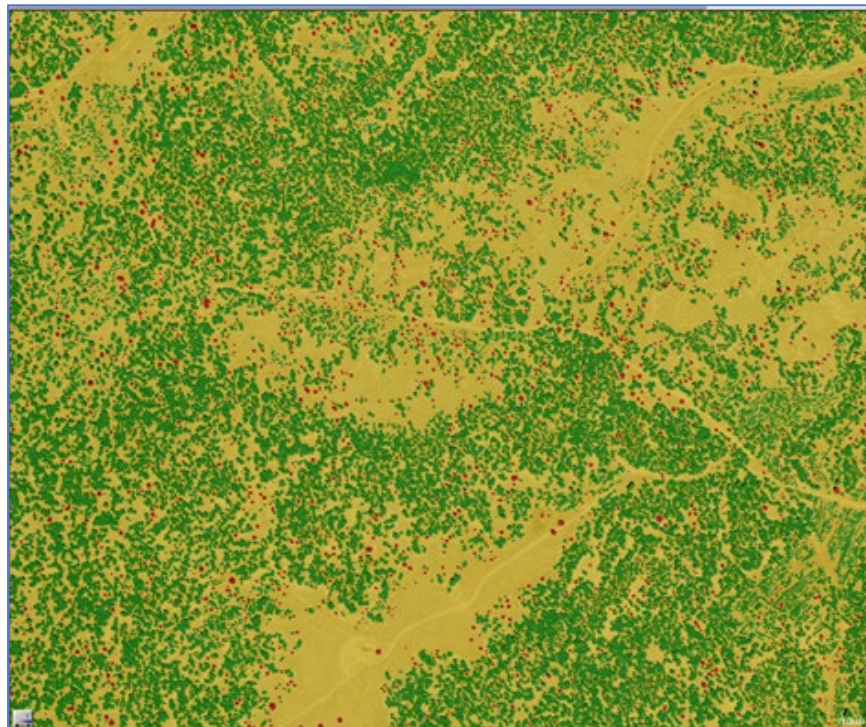
Recall: To collect sample data you need to activate the **Select Sample** button (see following graphic) on the Sample Toolbar (make sure it is still active—**View, Toolbars**, then **Sample**)



You must “highlight” the class in the **Class Hierarchy** window, for the class you want to select samples for.

Double-click to select an object as a sample, and double click it again to deselect it as a sample.

5. Once you have selected all your **sample data** for both the **Ground** and **Tree** class, you are ready to Execute the **Classify** process and all the subsequent processes. You can manually Execute these by right clicking on them and choosing **Execute**.
 - i. Hint: **Right-click the Parent processes** and choose **Execute** to run all Child processes associated with that Parent.
 - ii. Your **final output** may look similar to the following graphic.



Congratulations! You now understand how to use eCognition to generate segments and to classify an image. This classification workflow used both spectral (color) and shape (elliptical



fit) characteristics of the image objects, demonstrating the powerful image analysis capabilities of the eCognition software.



Appendix 1: Using the Assign Class Algorithm for the Entire Tree/Non-Tree Classification

A. Assess Mean NDVI Thresholds

1. Use what you learned in Part 5, Step B of this exercise to view the Mean NDVI values of tree and grassland/ground objects/segments.
 - i. The goal is to understand the threshold value for the NDVI that separates trees from non-trees. Hopefully you will determine that a threshold of 115 or greater should capture the trees.

B. Append new Parent and Child - Assign Class process

Now you will create a process that first classifies Trees.

1. In the **Process Tree** window, let's overwrite the previously created classification processes. Double-click on the Classify parent process to open the Edit Process dialog.
 - i. In the **Edit Process** dialog rename the Parent process **Classify by Assign Class** and click **OK**.
2. Next, **double-click** on the **Classification** child process to open the Edit Process dialog.
 - i. From the **Algorithm** menu, change the algorithm from **classification** to **assign class**.
 - ii. Next, you need to set the **Condition** for the NDVI value that separates Tree from non-tree. To do so, click the empty space next to Threshold condition and then on the three dots **"..."** to open the **Edit condition** dialog.
 - (a) Click in the cell that aligns with the Value 1 column and the first Condition row. Use the drop down menu to select **From Feature...**
 - (b) In the new dialog box titled Select Single Feature, navigate to and **double-click** on the (mean) **NDVI** feature (under **Object Features**, **Layer Values**, then **Mean**). This will return you to the Edit condition window.
 - (c) In the same row, use the drop down menu to change the Operator to **>=** (greater than or equal to).
 - (d) Then update the Value 2 cell in the same row to the threshold value identified in the previous steps (**115**). Here you can just type in the cell instead of using the drop down menu.
 - (e) Hit **OK** to exit the **Edit condition** dialog.
 - iii. Lastly, you need to set the class that will be classified as this in the **Algorithm parameters** section. Under the Value, click once and from the drop down select Tree. This will assign the Tree class to all segments that meet the threshold condition.
 - iv. Execute the Classify by Assign Class process.
3. Turn the **segments off** and the **classification on** (see following graphic).



4. **Review** the classification. If any trees were missed (see example in following graphic), determine what that segments' NDVI value is and adjust the threshold as needed and rerun.



Note: At this point, you have the Trees classified. If this was all you cared about, you could go to Part 6 of this exercise and Export the results. If you choose to select the Single trees, you can simply add another Assign Class Child process below the Tree selection process and use the steps in Part 5 to guide you. There are many ways to classify and to extract information from the segments. The goal of this exercise was to show you a couple ways to do the same thing. Sometimes when the classification is very simple (only 2 classes) and the classes are easily distinguishable, it may be best to use the Assign Class approach.