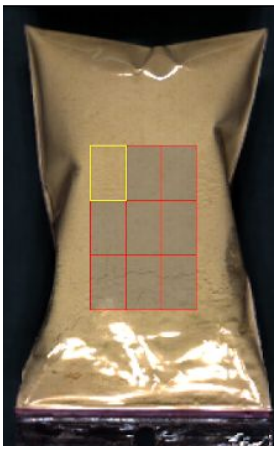
Breeze - Segmentation guide

This guide will show you how to use the different types of image segmentation that are available in Breeze.

Note: The method “Segmentation by model” is covered in the tutorials “Powder Quantification Tutorial” and “Classification_of_nuts_step1_basic”, and that will not be covered in this guide.



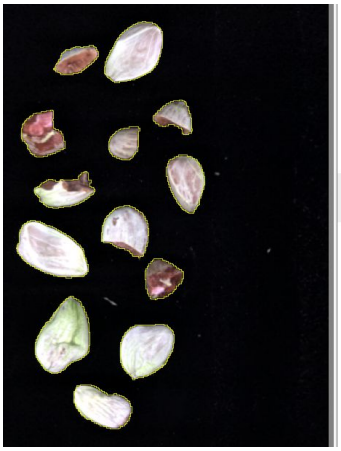


Table of content

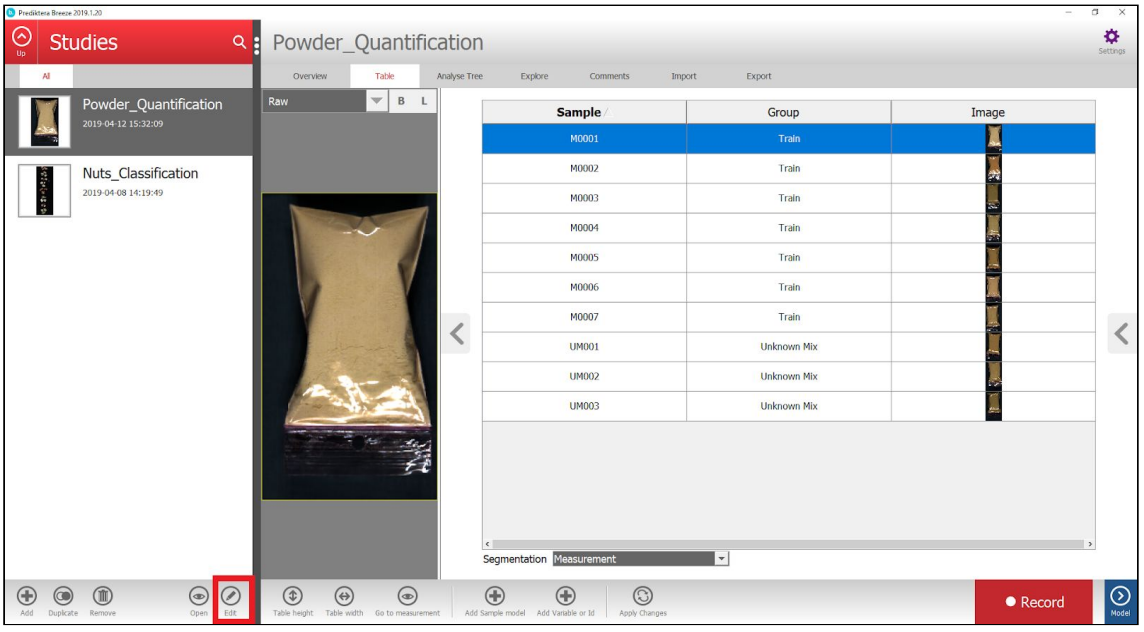
Available segmentations

Segmentation by	Description
model	Use a “Sample model” to exclude background pixels that are outside the model’s critical distance. The model is trained using manually selected sample pixels. Alternatively the model can be trained on pixels that belong to the background (pixels inside this model are excluded). Option to specify minimum area for sample objects and to remove a specified number of border pixels (shrink).
model expression	Use quantification or classification models together with an expression to specify what pixels should be sample.
intensity	Use spectral band intensities (pseudo absorbance values) in a logical expression (e.g. compare different bands or/and by constant)
grid and insets	Create a grid that divides the sample objects into specified number of rows and columns and use optional insets for top, left, bottom, right.
structure	Segmentation for finding objects based on a structure/texture change on a surface, for example holes. The spectral band that is used can be set.
horizontal interval	Segment using one or several horizontal intervals based on pixel number
pixel coordinates	Specify pixel coordinates with x and y distance from origo of image or center of object.
manual selection in pixel explore	Segmentation from manual selection of region of interest in “Pixel Explore”
representative spectrum	Collect a specified number of representative spectra that are spread out over the segmentation (instead of using average spectrum)

General instructions

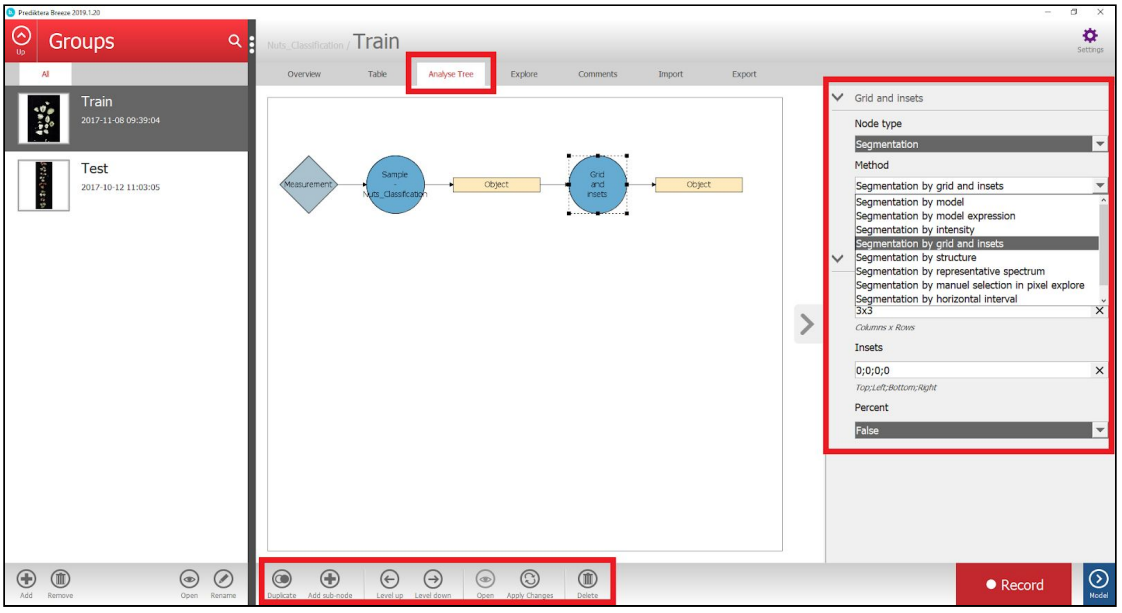
Views for setting up your segmentations

Option 1:
One view is by using the menus available under the **“Study settings”**. Open this by pressing the **“Edit”** button for your study.



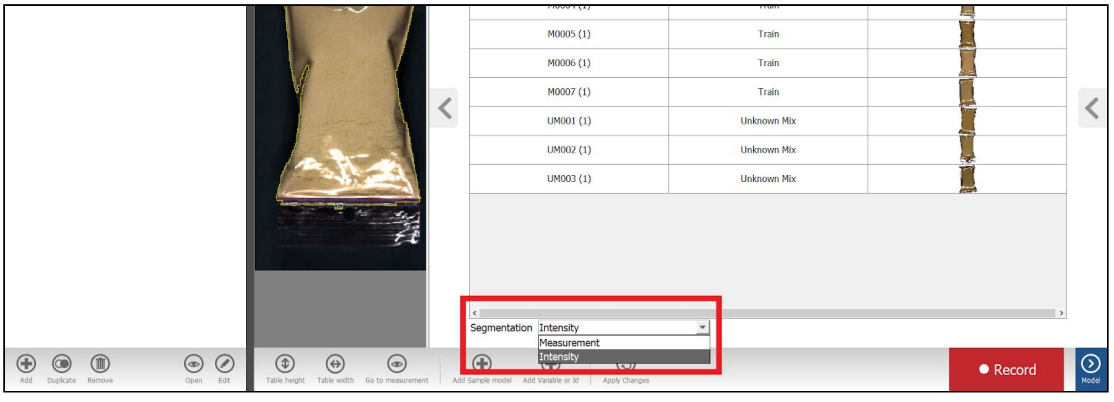
Note: This view will be shown in all the examples in this user guide.

Option 2:
The other view is to open the **“Analyse Tree”** tab. Here you have a graphical presentation of the different steps in your segmentation. By clicking on a node in your “tree”, you can change the settings for it in the menu on the right. Under the picture of the tree you there is a menu to Add, move or remove nodes. The options in the “Analyse Tree” view are the same as under Study Settings.



Switching between different Segmentations

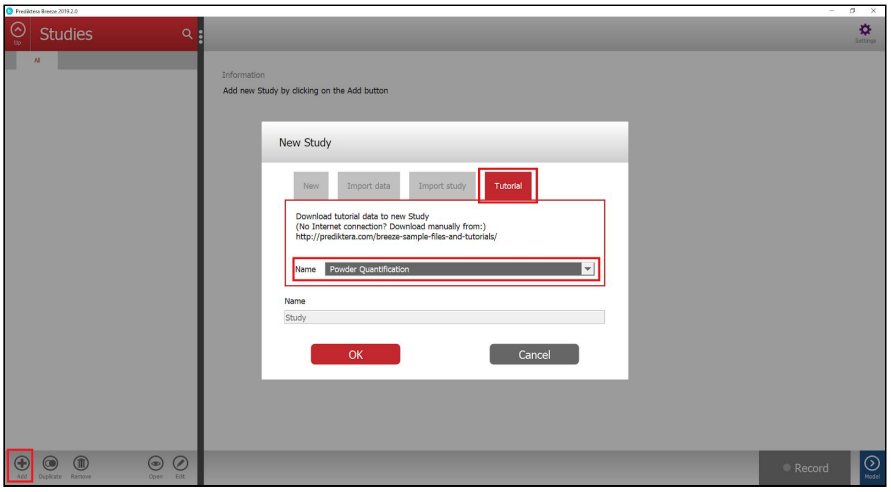
You can change the segmentation that you want to look at by using the menu under the table.



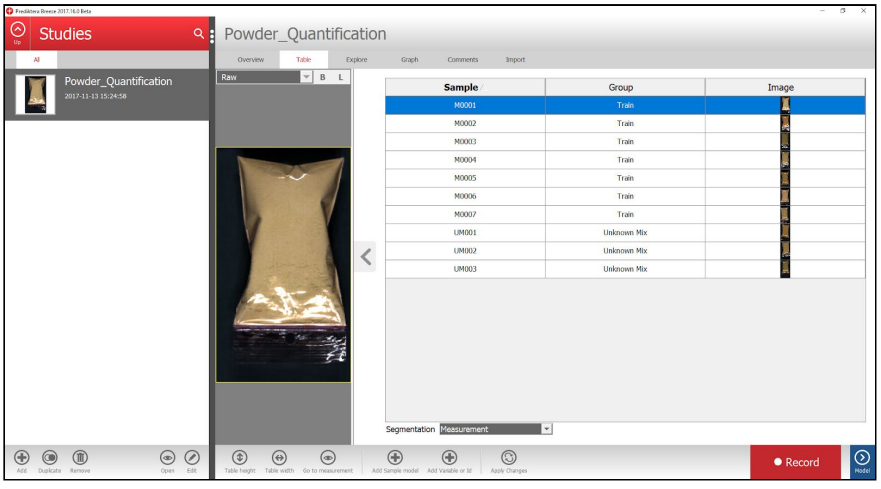
Examples

Intensity segmentation

1. Create new Study in Record by pressing **“Add”**. **Choose Tutorial** and “Powder Quantification”.
   Press OK

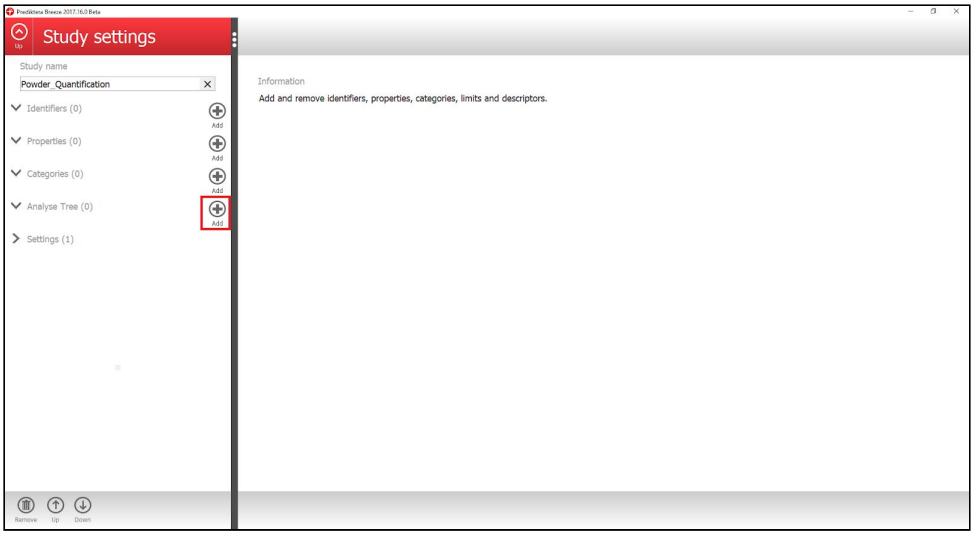


2. The view should look like this:

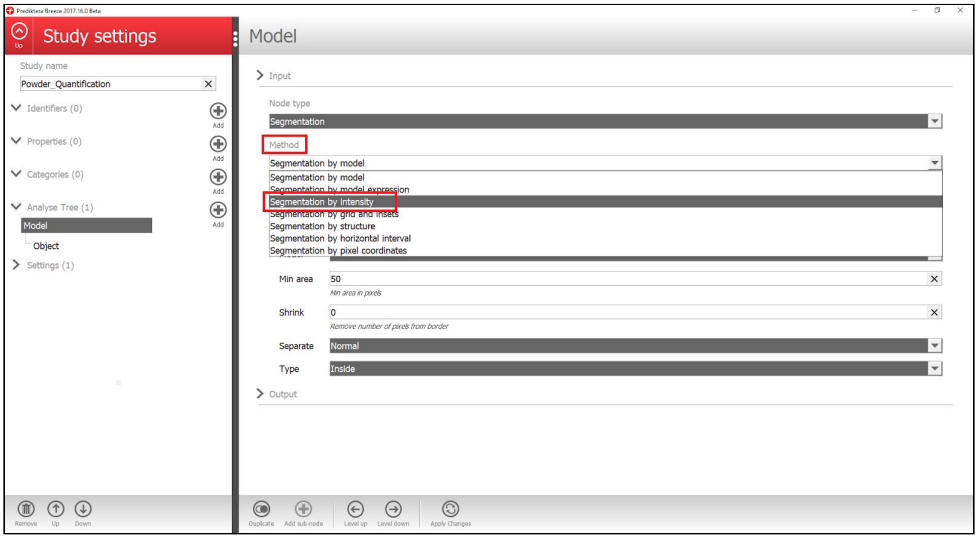


3. **Press “Edit”** button on the toolbar

4. **Press "Add"** button beside the "Analyse Tree" to add new Segmentation or Descriptor



5. **Change "Method"** to "**Segmentation by Intensity"**

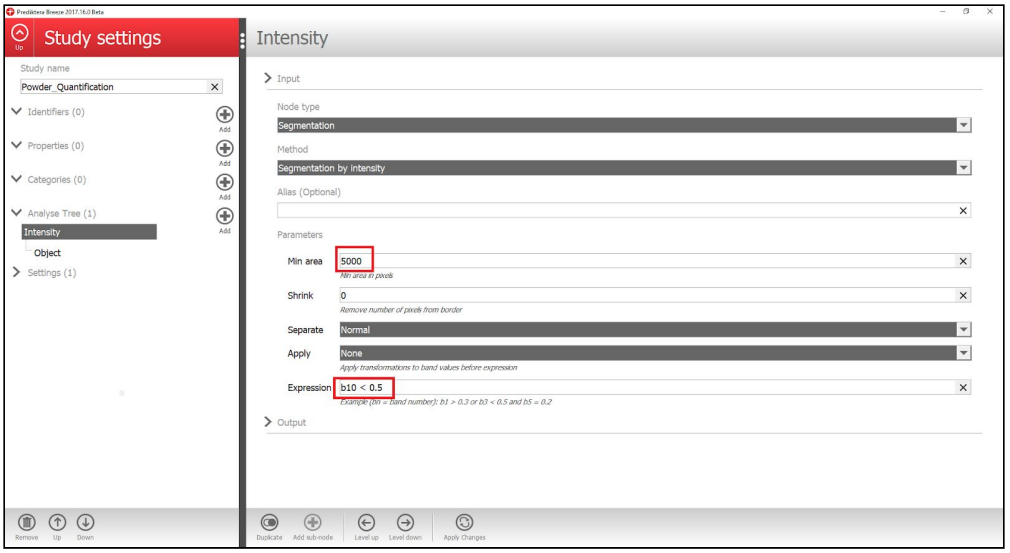


Segmentation by Intensity uses a logical expression to segment the sample objects. The logical expression can compare different spectral bands with each other or by a set value of intensity. The spectral band variable format is b[band index] and starts with a "b" followed by the band index; for example b10 mean band index 10.

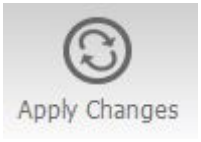
Note: The value from band index is either pseudo absorbance value if data includes white and dark references, if else raw spectral value.

6. **Change "Min area"** size to **5000** to exclude small objects

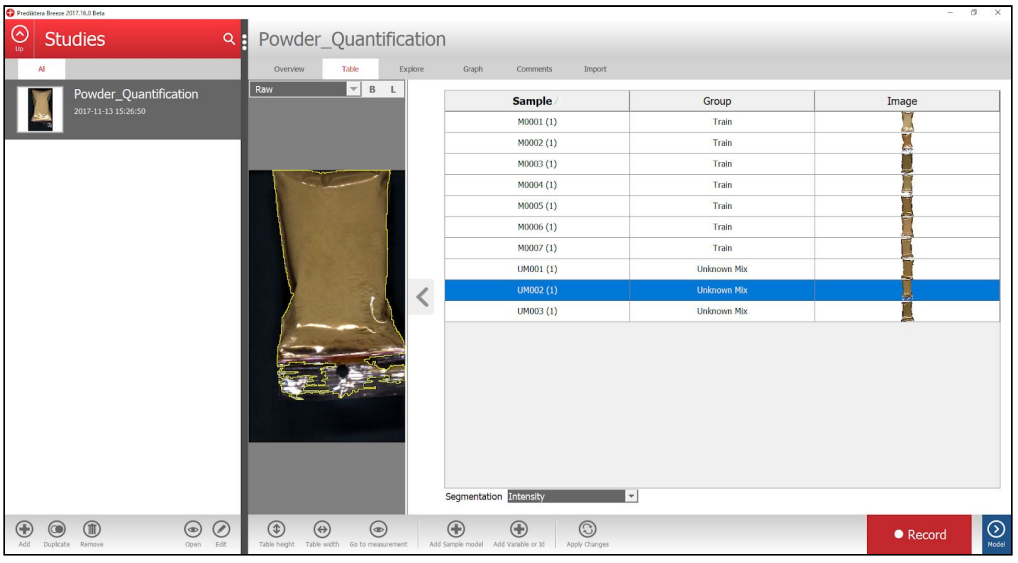
   Set "Expression" to **"b10 < 0.5"**. This means that band index 10 should be below the intensity of 0.5.



7. **Press "Apply Changes"** and then **Press "Up"** button

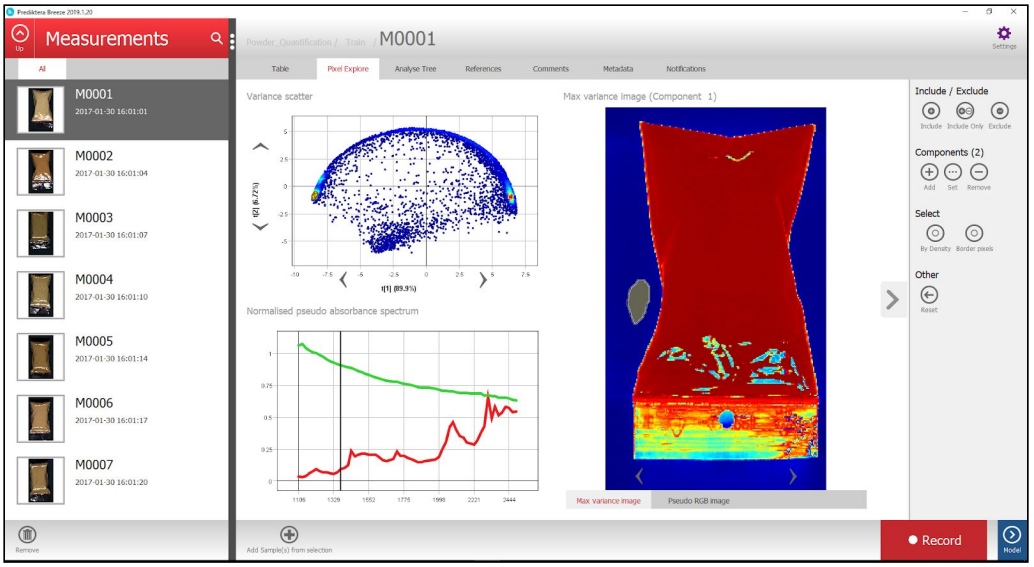


8. The table view should look like this:



Note: The yellow segmentation selection line is now around the plastic bag in the measurement preview.

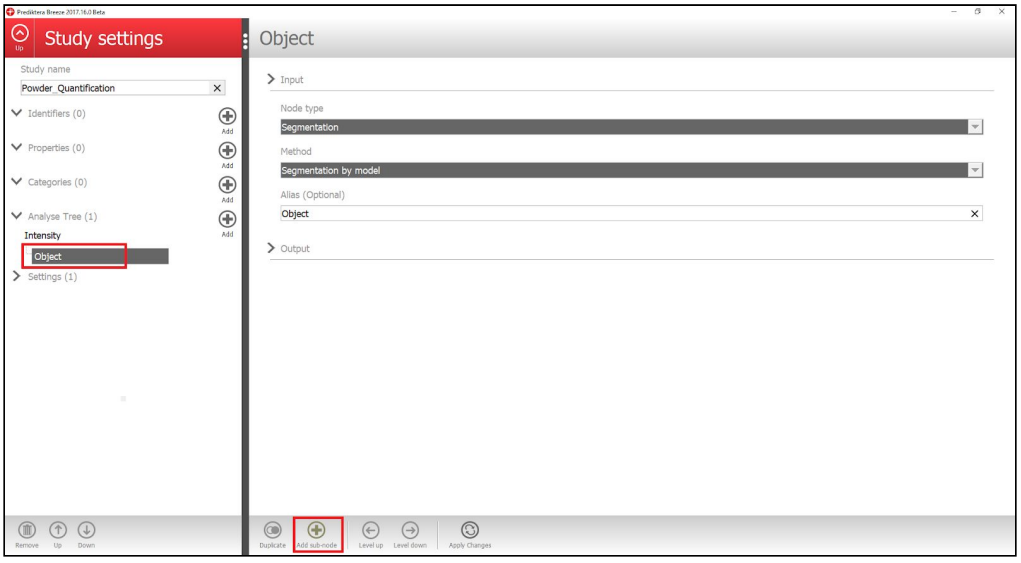
Tip: By look at the “Pixel Explore” tab and selecting a region inside the sample and a region from the background, you can compare the average spectral profiles for the different materials. You can then get an idea of the spectral bands where you have a big difference, and also what intensity value to set.



Grid and Insets segmentation

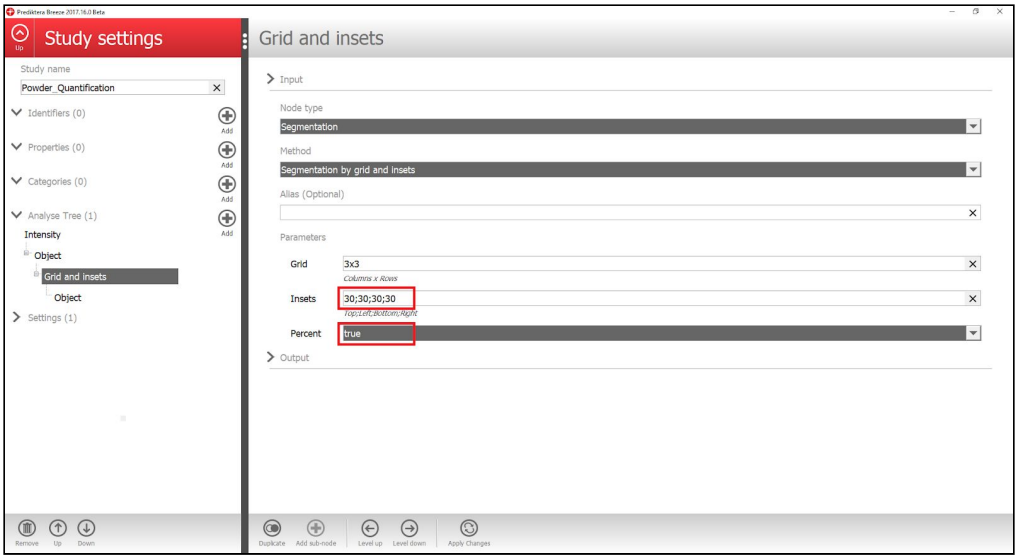
1. **Press “Edit”** button again

2. **Select the “Object”** node in the **“Analysis Tree”** and then Press **“Add sub-node”**



3. **Change "Node type"** to **"Segmentation".**
   Change "Method" to **"Segmentation by grid and insets"**

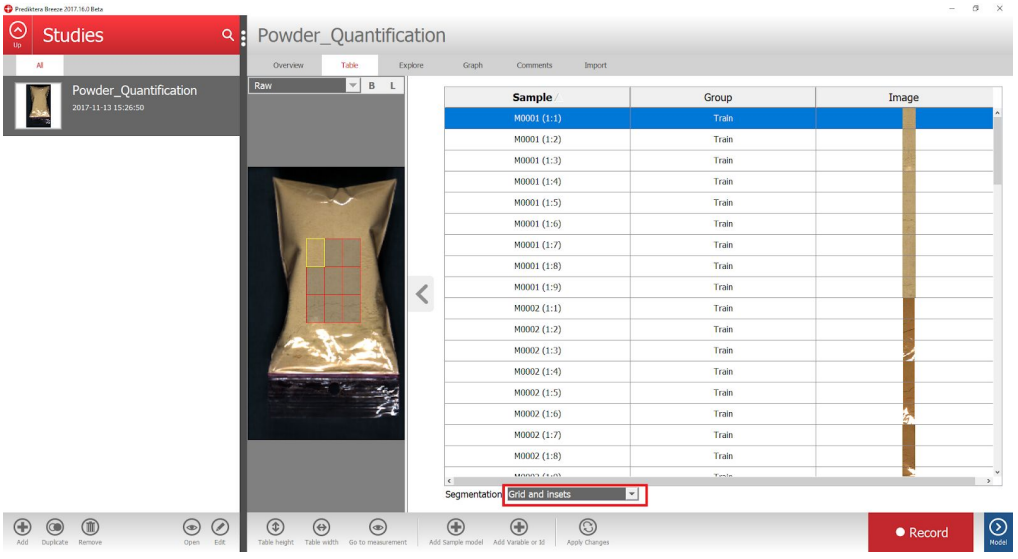
4. **Change "Insets"** to **"30;30;30;30"** (Top;Left;Bottom;Right)
   Change "Percent" to **"true"** (If percent is false it will use insets as pixels)



5. **Press "Apply Changes"** and then **Press "Up"** button

6. **Change "Segmentation"** to **"Grid and insets"** in the drop down menu.
   The view should then look like this.

   An inset of 30% has been applied from each side. The sample has then been divided into a 3x3 grid creating 9 sub sub-samples.

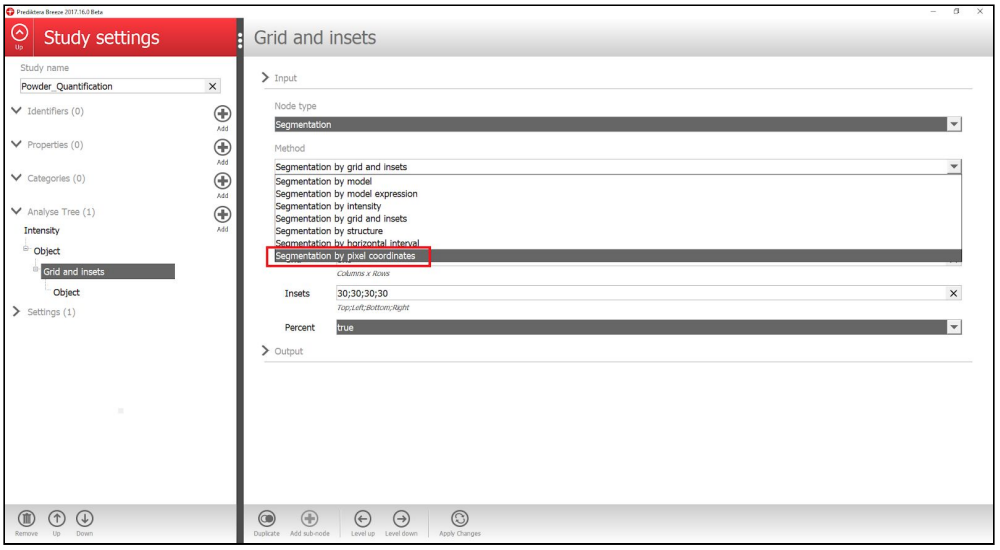


Note: It's easy to change between segmentations using the "Segmentation" menu

Coordinates segmentation

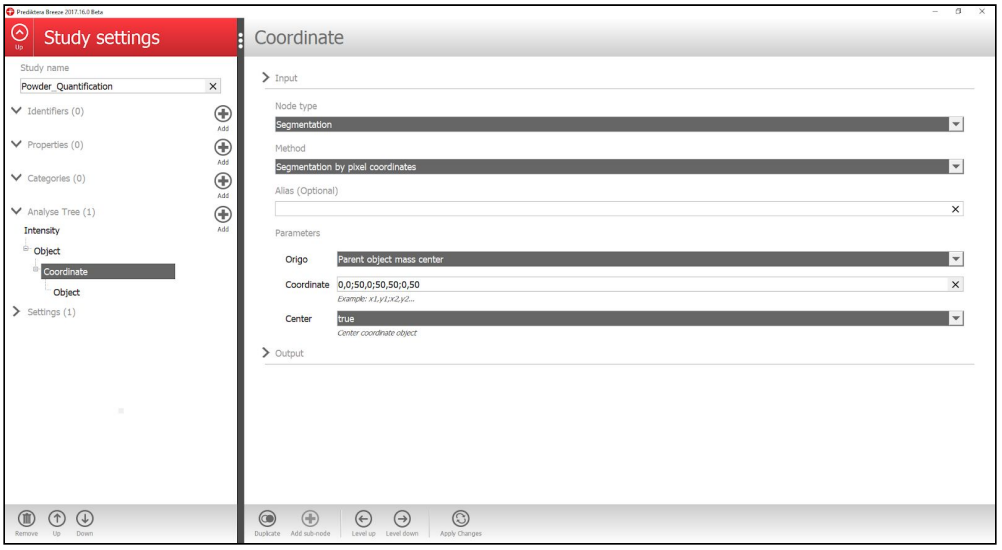
1. **Press "Edit"** again

2. This time **select "Grid and Insets" node** in the **"Analysis Tree"**.
   Change "Method" to **"Segmentation by pixel coordinates"**



You can change the origo for the coordinate system. The default in the upper left corner of the parent sample. The coordinates will by default be centered around origo.

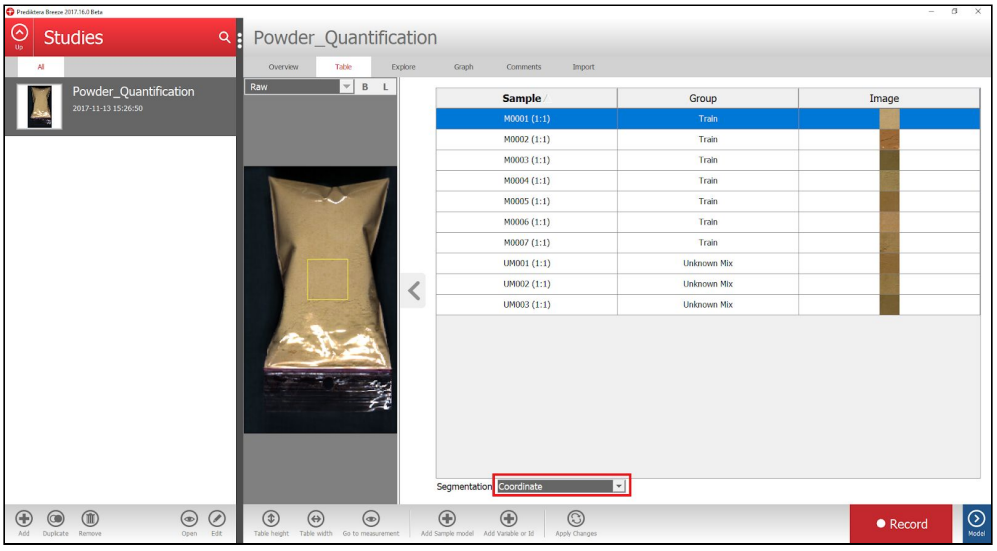
3. **Change "Origo"** to **"Parent object mass center".** The segmentation will now be in the center of the object.



4. In **“Coordinate”** you specify the size of the segmentation. The coordinate is written in the number of pixels for the 4 corners of the segmentation starting in the upper left (x1, y1), upper right (x2, y2), lower right (x3, y3) and finally lower left (x4,y4). In this example we will not change the default (this will be square of 50 pixels).

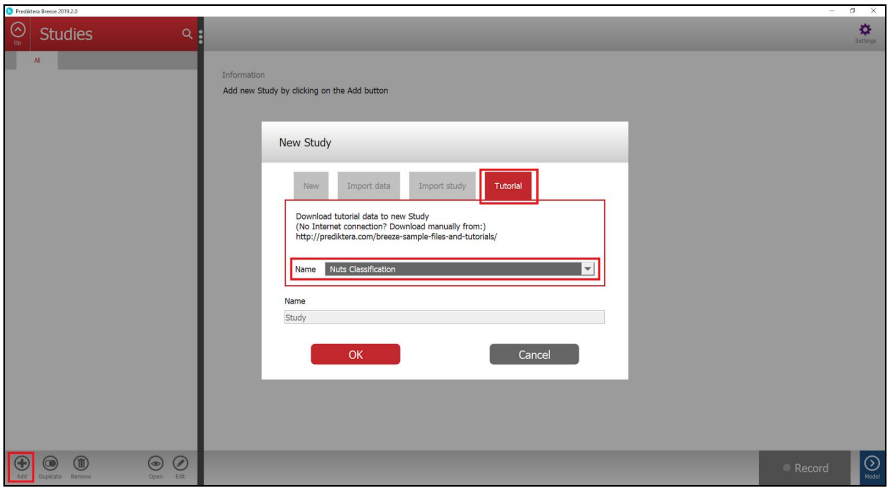
5. **Press “Apply Changes”** and then **Press “Up”** button

6. **Change “Segmentation”** to **“Coordinate”** in the drop down menu.
The view should then look like this

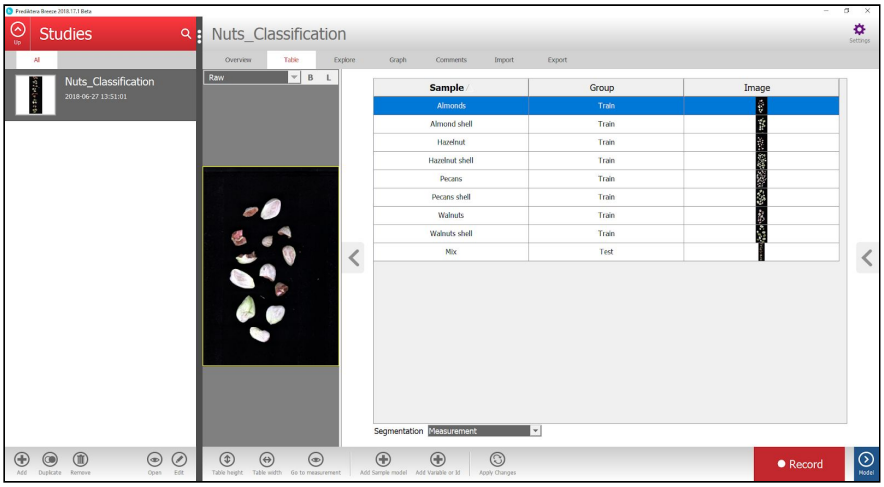


Manual segmentation

1. Create new Study in Record (Press “Add”). **Choose Tutorial** and “Nut Classification”. **Press OK**

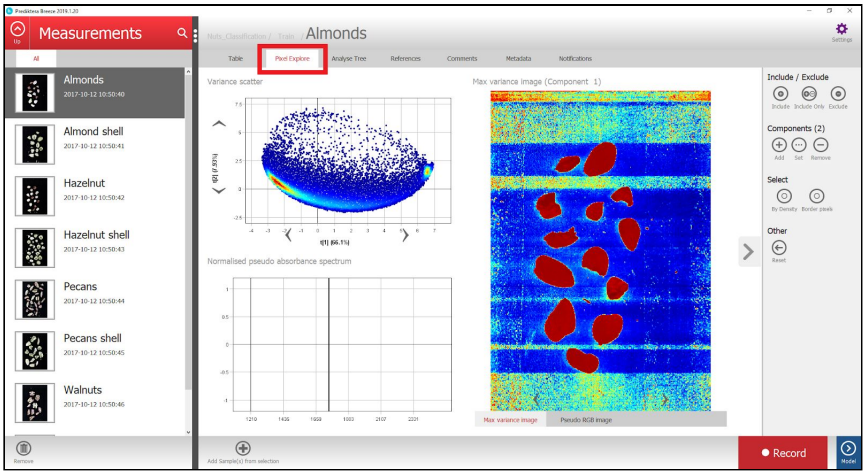


2. The view should look like this:

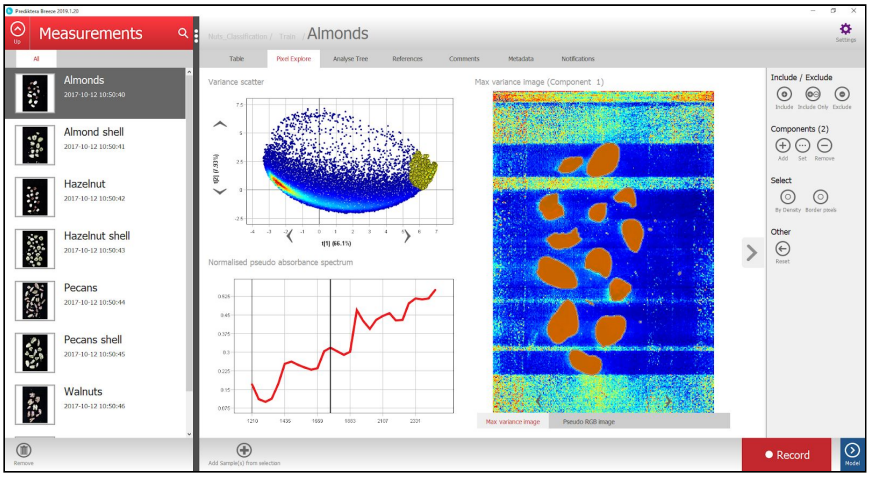


3. **Press "Go to measurement"** button on the toolbar

4. **Press "Pixel Explore"** tab



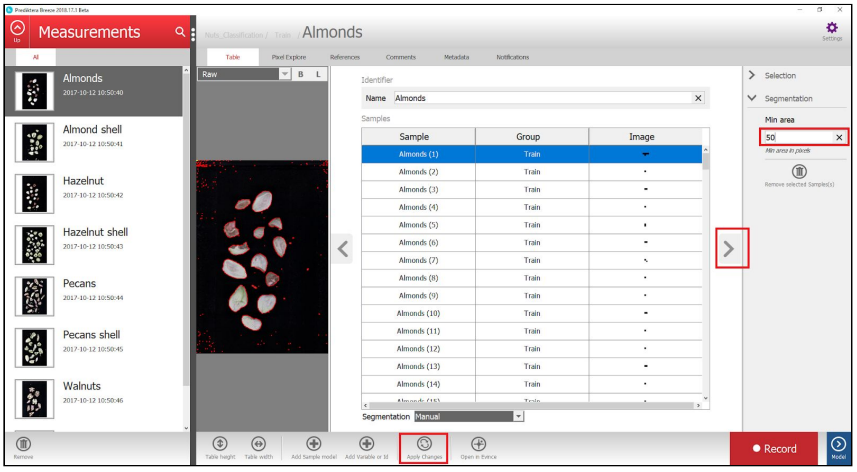
5. **Select area** of interest in either “Variance scatter” or “Max variance image”



6. **Press “Add Sample(s) from selection”** button.

Samples are created from the selection and you are back in the “Table” tab

7. Adjust segmentation settings in by toggling the right settings panel



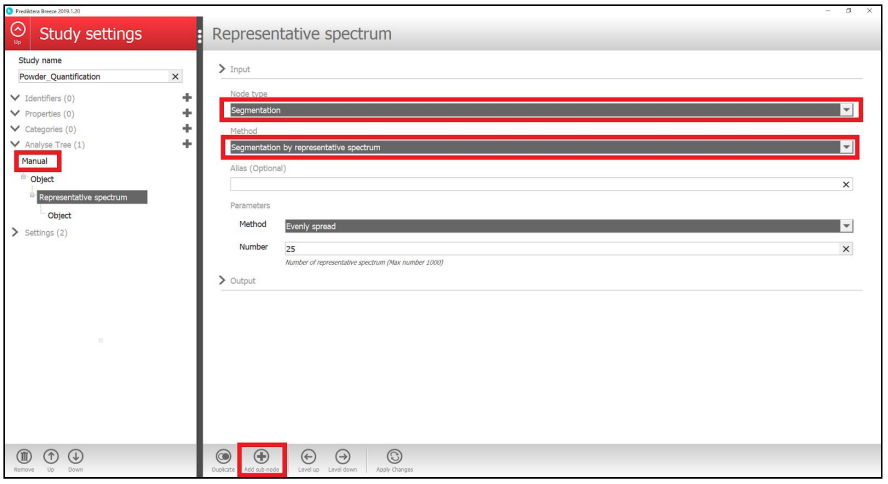
Change for example the **“Min area”** to 50 and the **press “Apply Changes”**

Note. Unwanted object can be removed by pressing the “Remove selected Samples(s)” button in the settings panel

Representative spectrum

1. **Go back "Up" to Study level and Press "Edit"** again

2. **Select the "Manual"** node in **"Analysis Tree"** and **Press "Add sub-node"**

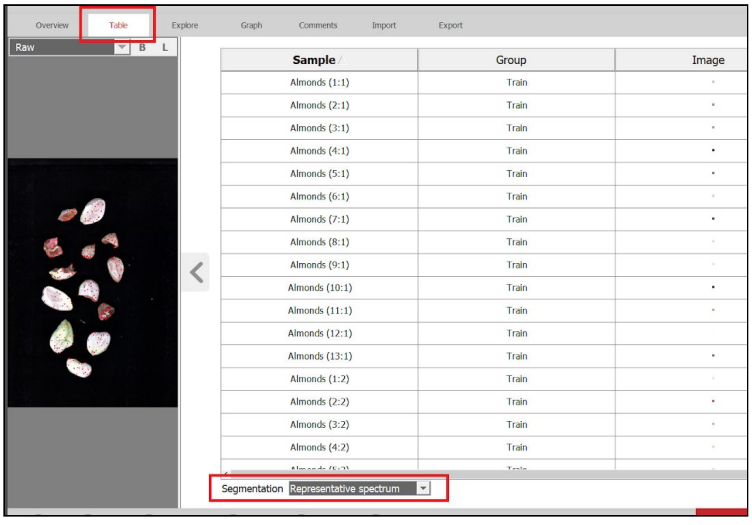


3. **Change "Node type"** to **Segmentation**
4. **Change "Method"** to **"Segmentation by representative spectrum"**

   "Method" can be changed to (different methods for spatial distribution):
   Evenly spread, Random, Random (Gaussian)
   Set "Number of representative spectrum"

5. **Press "Apply Changes"** and **return "Up"**

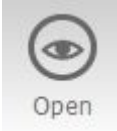
6. **Go to "Table" tab**
   Change Segmentation to **"Representative Spectrum"**



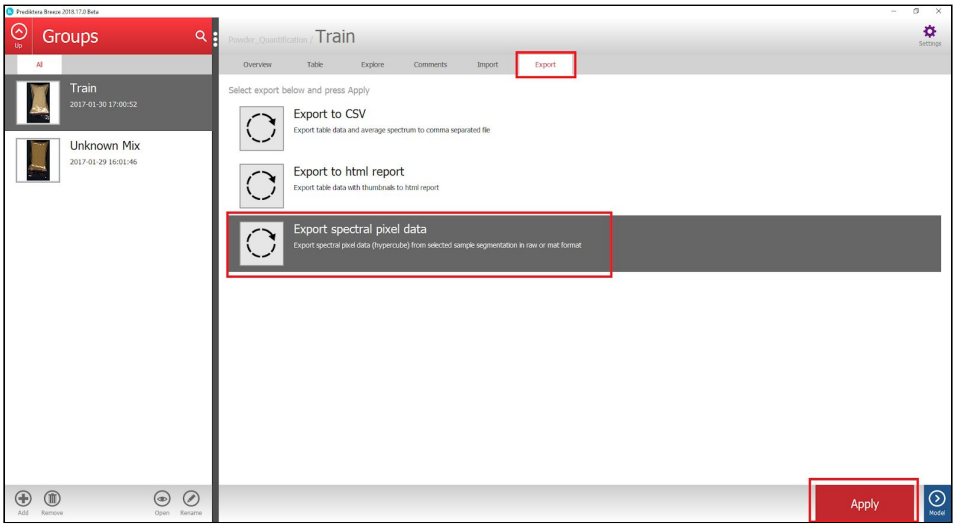
As you can see 25 pixels (i.e 25 spectra) has been selected from each sample.

Export segmentation

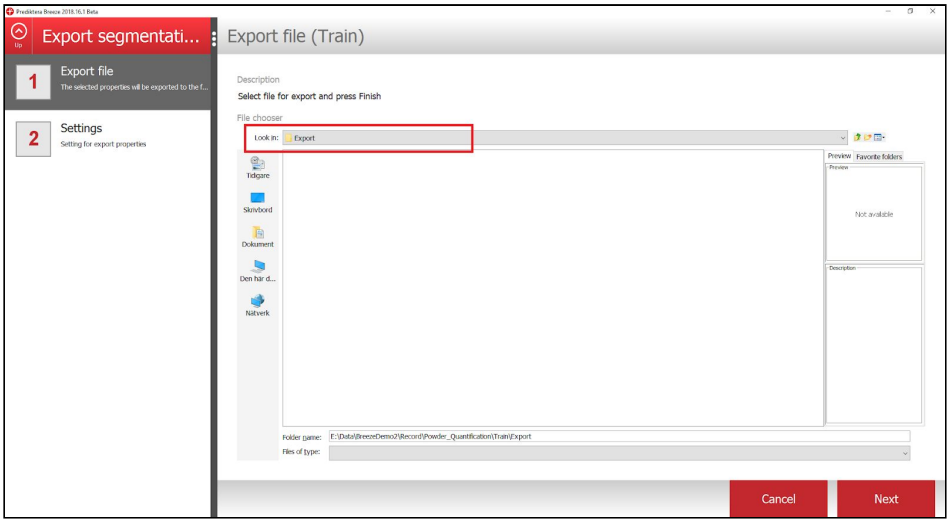
1. **Press "Open"** study to go to show groups



2. **Select group** to export, **select "Export"** tab and **select "Export spectral pixel data"** (export the whole study by selecting the study instead of the group)
Press "Apply" button



3. **Select folder to Export** to and **press "Next"**

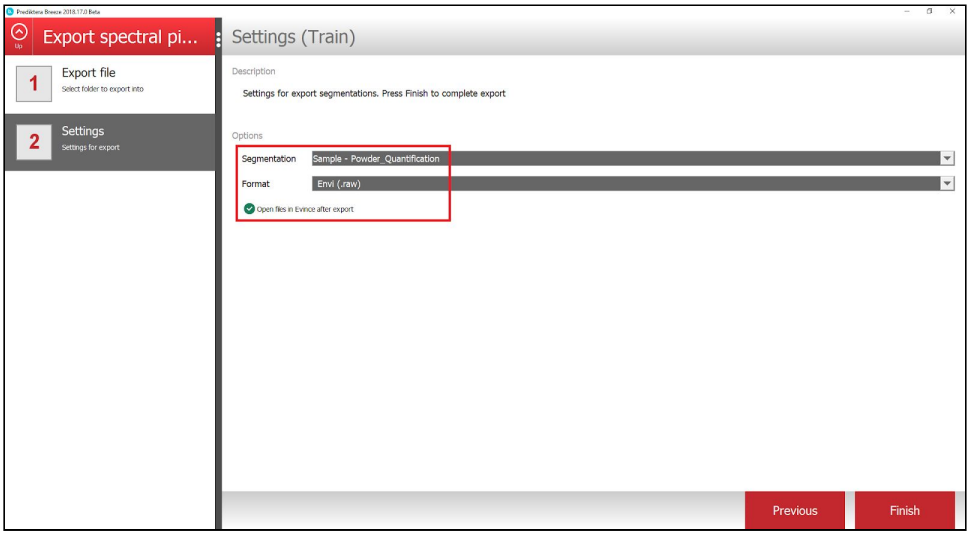


4. **Choose segmentation** to export

   Choose "Format" (Raw or Matlab format)

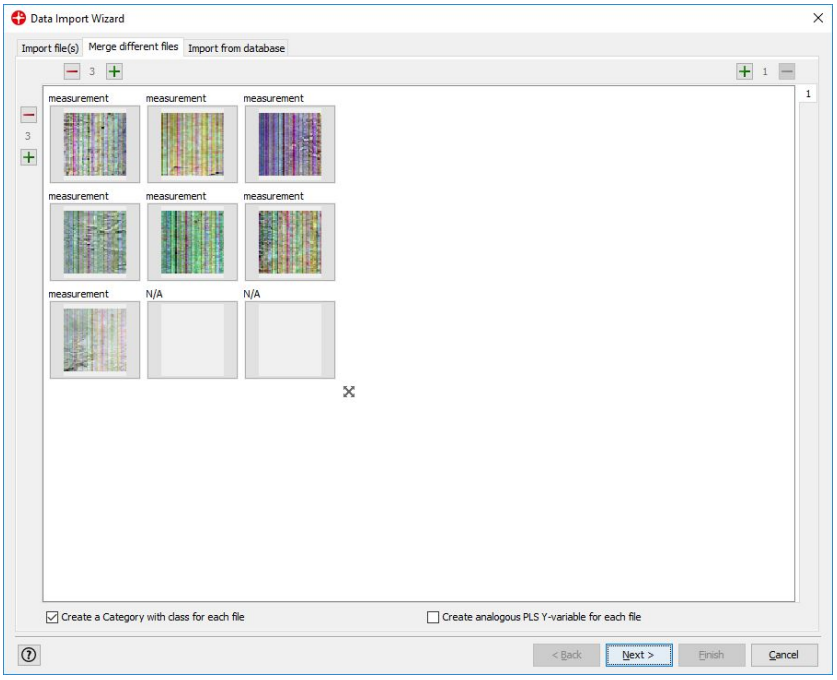
   Option: **Select "Open files in Evince after export"**
   Note: *Requires that Evince is installed. You can also open the exported files in Evince manually.*

   Press "Finish"

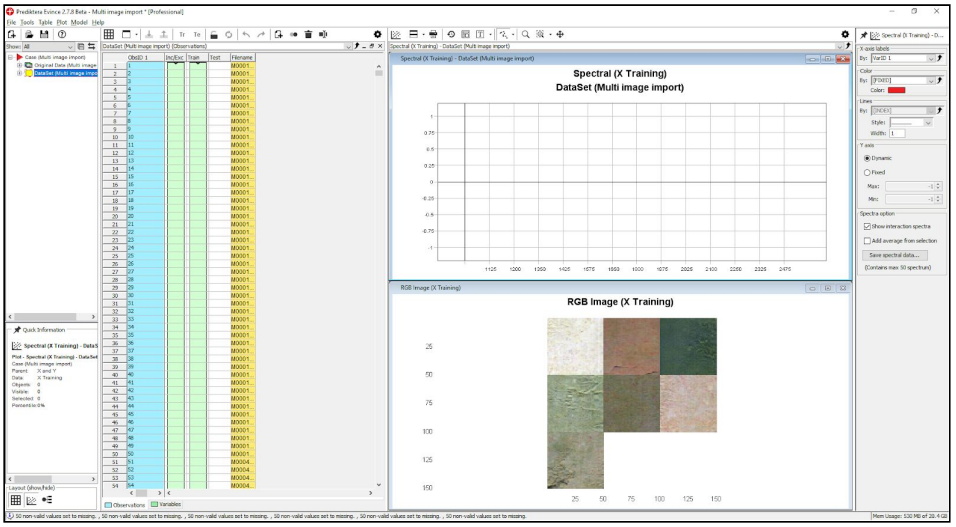


5. The data is now segmented and exported to the selected folder

6. If "Open files in Evince after export" is selected, wait a few seconds and Evince will open and show "Data Import Wizard" with "Merge different files"



7. Finish the wizard and start working with the data in Evince



The Segmentation guide is now finished!

Feel free to test other segmentation options and play around with the Powder Quantification tutorial data.