

# GEOG432 Fall 2018: Supervised classification

Start Geomatica2017

## 0. Good habits - labelling new and existing channels

You can change the labels on image channels - and should for badly named channels and some new channels if it's not clear what they are. You may remember from labs 1 and 2, that the bands for the 2011 image are labelled something like: "transferred from ....." . Rename them so you can easily see what they are:

Open your copy of the PG2011 Landsat image: **pg14sept2011.pix**

Q: How do you know this image is Landsat 5 Thematic Mapper ? -You really should know!

- switch the maps tab to files

expand the rasters list and check the labels – rename them to something like:

Blue 2011, Green 2011 ... NIR2011, MIR (or SWIR) 2011a, MIR2011b etc.. include the band numbers if you wish

you can also use: right-click -> properties and edit the channel descriptions as needed

Note that you can also do this under the files tab, but then any changes are for that session only and not saved or permanent

## 1. Supervised Classification session: Prince George 2011 image

Unsupervised classifications are quick, supervised are not as quick due to the need to know and create training sites; This part of the lab will progress slower than last week ....

I'm picturing maybe 7 classes for the image:

Water, Coniferous, Deciduous, Fields, Cutblocks, Industrial, residential (add another if you like!)  
(mixed forest is also an option, but harder to identify)

- Analysis -> Image Classification -> Supervised
- Select your file **.pix** and then select new session
- Click on Supervised .. then click 'add layer' button
- You may need 4 empty 8-bit channels - unless you already have empty channels
- Display channels should be 5,4,3 (RGB)
- Input channels should be 2,3,4,5,7; tick in Input channel column
- Set the training channel to an **empty** channel number (tick in that column)
- Set the output channel to another **empty** channel (tick in that column)
- OK

*'Training Site Editing' box appears*

- Add a new class, (class->new) change its name to water, Zoom into the image area with water
- Pick the 3rd icon in the 2<sup>nd</sup> row, main focus window (below View) – looks like a zig-zag ‘new shapes’, and from the dropdown, pick raster seeding.

(one can alternatively choose to edit create training polygons ...)

- The raster seeding window controls its functionality with two tolerance settings

These are currently set to 10 and 1X, increasing either increases the deviation that is allowed in including pixels adjacent to wherever you might click. For now leave these as is and click on an area of water, I suggest the confluence of the two rivers

**Ensure that the training areas (channel) are highlighted in the table of contents** - seeding can be picky (otherwise seeding can't be selected)

Select 2 seed points for water around the scene - note that you will want at least to cover clear water (Nechako) and silty water (Fraser); also pick a lake ... you can change training colours, but DON'T PICK BLUE for water or you can't see your sites ... the defaults are acceptable

The goal is to find a sample of water pixels, not to 'fill' the river: **DO NOT TRY TO FILL THE RIVER WITH SEEDED PIXELS - THIS DEFEATS THE POINT OF THE ALGORITHM.**

its a good idea to hit the 'save' button periodically in the Training Set Editing window

..when done each class, 'save', add the next class, and repeat seeding process for other classes. Usually pick two seed points for each class training 'set' - and view for different DNs for the same cover type, e.g. due to different illumination (more important in the mountains). For fields and cutblocks, try to pick two sites that represent the range of possible values / colours.

**Oooops- what happens when ...** you added too much, picked a seed point that spread too much, added something to the wrong class etc.

There are two ways of dealing with this, the easiest is to remove/clear that seed and start over...

- In the training site editing window highlight the class with the mistake
- Select Edit – Clear Selected

You can also use this to remove the entire class selection

- Select Edit – Delete Selected

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Add these classes to your classification

- Water

- residential
- industrial / concrete
- cutblocks
- agricultural fields
- deciduous forest
- coniferous forest
- another if you can see one

If you are ready, in the training sites window, check **tools -> signature separabilities** for suitability of classes and training areas - ideally each matrix value is  $> 1.8$  (but this is only a lab exercise, so no need for excessive rigour)

To view the stats for the class signatures ( mean central DN for bands 2,3,4,5,7)

**Tools-> signature statistics**

Now the gripping part:

**Tools-> classification preview**

shows how it will look .. go back if it looks doomed and make edits

You have these options - try them all:

Minimum distance

Parallelepiped

Parallelepiped with MLC tiebreaker

Maximum likelihood

Maximum likelihood with null class (null = black) – what is UNBC ?

Pick the best two based on observation of areas you know

As per class notes, one might expect the best to be MLC or MLC with null - MLC will classify the whole image, while with null indicates if you may be missing a class type. You should preview how this compares with the RGB bands, by toggling the classification on / off  
When you are done, select Save and Close in the Training Site Editing Window.

right-click on the classification metalayer in the table of contents and select **Run Classification**. Perform a maximum likelihood classification. Make sure the show report button is depressed.

**In the report window** which classes are most confused ?

why are these classes confused and not others? (maybe none!)

Run a second classification you liked as much or better (use another output channel)

## 2. SIEVE

The parameters will be similar to these:

input = ## (classification channel)

Polygon size threshold = 12 (for 1 hectare minimum), or 24 ...

Connectedness - can be 4 or 8

exclude values list = ## (where ## is the class number for water - preserve small wetlands)

output port should be viewer - PCT

select log tab and run ...

View the result, compare with the unsieved classification.

When happy with the result, Re-run the sieve putting output to your pix file – use BROWSE button - remember everything goes into the pix file, don't put it somewhere else ... Run

After this is done, view your raster layers listing to check you have a sieve layer

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## 3. Accuracy Assessment

How could you assess which classification was better - you'd need some independently derived 'ground truth' plots to test against: (these would be generated from ground work or other background knowledge). The purpose of the accuracy assessment is to create a report which indicates the accuracy of classification results compared to the raw image data. It compares what is assumed to be correct with an image classification based on pixel groupings.

Under the CLASSIFY menu, select "Accuracy Assessment".

Select "Select Classified Image" and choose the results of the Advanced Supervised Classification (the Maximum Likelihood Classification).

Select "Load Reference Image" and load channels 3,4, 5. You will notice that a full resolution window is also created. This will be used during the random sample selection.

### Generating Random Samples

Select "Generate Random Sample" and increase the sample number to 5.

Leave the "Sample Control Options" section to the default answer, "yes". Press "Accept".

In the Accuracy Assessment Panel, you will notice that 5 sample points have been added to the "Random Sample List". The idea here is to highlight the first point in the sample list and observe where it is located on the image (the cursor will automatically be placed at this location).

Compare this location to the class list and select the class to which you believe it should belong.

Ideally the pixel is in a relatively homogenous (not mixed) area .. if this is not the case, ignore/reject that pixel if you can. Once the random sample you are working with has been highlighted, you can simply select the class it belongs to and the information automatically transfers to the random sample list. This works the same as the "Transfer" button.

Samples could also be taken from vector segments e.g. vegetation polygons.

The user is given the option of selecting the channel and the class attribute associated with it.

## Produce Accuracy Report

Once all 5 samples have been assigned to a class, select "Produce Accuracy Report".

NOTE: This option will not be available unless a classified image has been selected.

The results of the accuracy assessment are shown in the form of a Random Sample Listing, Error (confusion) matrix and as an accuracy statistic.

The Sample Report Listing can be used to determine which samples were classified correctly.

**The Error (Confusion) Matrix** is a method for displaying the results of the accuracy assessment process. Reference data are listed in the columns of the matrix represents the number of correctly classified samples. Errors of omission are represented by the non diagonal column elements, and errors of commission are represented by non diagonal row elements. The Accuracy Statistics report lists statistical measures of overall accuracy and accuracy per class.

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## 4. Landsat 8 OLI image data

We should see how the newer 16-bit data from Landsat 8 OLI behaves in comparison.

Repeat steps 1-2 for the 2013 image – Landsat 8 OLI (use bands 3-7 ... for input), presumably you will find the same algorithm seems to work best. Note that the **two tolerance settings in the raster seeding step will need to be much bigger**. Sadly, the help does not help - experiment!

Do one classification and sieve as needed - accuracy assessment is optional

Comparing 2011 and 2013 might be interesting but you'd need to match the colours

Logout and back to the humdrum of less exciting courses .... or home

**No assignment questions this week**

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### FOR REFERENCE: Training site steps: the non seeding (polygon) method

Click in your chosen area

- Zoom in maybe to +4 or even +8
- Select 'Trace and Close '
- Draw your training area (holding the left mouse button down- don't 'click') in a polygon
- make sure you draw a closed polygon; make it fairly large within the feature
- Select 'Fill'
- Click inside your polygon: it should fill
- You could add another training site, if you feel this one has not captured a good cross-section of the class (keep it simple at this point)
- Type in the class name (water) in the description column
- Save
- New