**GEG 3105 APPLIED REMOTE SENSING PROJECT**

The objective of this project is to give you a chance to relate your interests to the course material by determining a problem or question within an area of your interest and applying remote sensing to solve (or assist in solving) the problem or question. Groups of 2 will be formed to answer this question using satellite imagery, data processing and analysis techniques and data interpretation. The results should be summarized in written report, similar to a short paper. The paper should include the following topics and corresponding project steps:

1. **PAPER STRUCTURE**

**1. INTRODUCTION**

Formulate the research question or objective, explain the importance of the topic and provide a brief background.

**Hint: Define the question you want to answer.**

In this first phase the group members should discuss a topic of their interest. Answer questions like:

* What do we want to study? Vegetation dynamics, sea ice dynamics, urban growth, coastlines, rivers, climate change and vegetation?
* Where do we want to study this? Ottawa, Portugal, Canada, North-America, Africa, China, etc…?
* Over what period of time? One point in time, days, weeks, months, years, decades?
* Why is this topic important?

**At the end of this phase you should have a very specific objective / question, such as:**

* Deforestation in the Amazonas between 2000 and 2005
* Urban growth in Quebec City between 1985 and 2011
* The relationship between increasing temperatures and gross photosynthesis in selected boreal forests between 2001 and 2011

**Important:** the answer to your problem question may involve multiple processing and analyses steps. You do not need to do all analyses, but you should indicate what you will provide in this first step of your project and you should indicate the future steps / analyses for your project.

**2. DATA COLLECTION AND MANAGEMENT**

Describe the data you used, including: the name of the satellite sensor; date and time of the image, projection info; spatial, temporal, spectral and radiometric resolutions; atmospherically corrected or not; etc. Always report the data source. **At the end of this phase you should hand in a map (from satellite imagery) of your study area (s).**

**Hint:** Once you have your question defined, start analyzing available data and match data characteristics with your project needs. Consider the following criteria:

* *Large study area (e.g. Canada, continental):* preferable to use MODIS data with spatial resolutions of between 250 m and 1,000 m. If you use Landsat which has higher spatial resolutions (~ 30m), you might run into serious storage and processing problems.
* *Smaller areas (e.g. a city, Ottawa*): you can use Landsat or MODIS data depending on your objective.
* Always download data that has geographic information included (e.g. geotiff, no simple JPG format)
* Select (close to) could-free images. Cloud cover is a serious problem, there are different ways to deal with it, but it will simply take too much time. You will need all your time for processing and analysis of your data.

**3. METHODOLOGY**

This phase is the core of your project. In this phase you should define, describe and implement the necessary processing steps, including (but not limited to):

* + Data downloading
  + Data import
  + Preprocessing (Atmospheric correction, noise reduction, geo-referencing and ortho-rectification, etc.)
  + Sub-setting: when you need to cut your study area from a larger image
  + Mosaicking: when you need more than one image to cover your study area you have to combine them;
  + Re-projection: when you are working with images that have different projections
  + Masking: when you want to isolate certain features for your study area
  + Classification: when you want to make a map with distinct feature classes (e.g. vegetation classes, land cover classes)
  + Vegetation indices: when you want to study biomass dynamics
  + Change detection: when you want to compare spatial changes over time.

**4. RESULTS**

Describe the results; show the final processed and analysed images.

**5. CONCLUSIONS**

Were you able to answer your question completely? What would you do differently if you could do this project again, in terms of data collection and data processing? What other studies could be done to provide more answers to this question? How do your results relate to existing literature on the topic?

**6. REFERENCES**

Acknowledge all the sources of data and information you used in your work.

1. **B. EVALUATION**

The project has a weight of 26%, with the following sub-division:

Introduction and objective 1 page. (3pts)

Ortho-Map (from satellite image) of study area, to be fitted in one page (2pts)

Methodology (data description and methods) 1-2 pages. (8pts)

Results and conclusions 1-2 pages or 3-5 slides max. (8pts)

Report (structure, writing style, format, appearance …) (5pts).

1. **DEADLINE**

December 7th 2013, before final exam session.

1. **RESOURCE**
2. Free eBook (available via uOttawa Network):

**Basudeb Bhatta, 2013, “Research Methods in Remote Sensing”, Springer.**

1. Canadian Center of Remote Sensing Tutorial (Chapters on Earth Observation Applications)
2. Internet resources for data:
3. [http://www.geogratis.gc.ca](http://www.geogratis.gc.ca/) : Natural Resources Canada Geo-portal
4. [www.GeoBase.ca](http://www.GeoBase.ca) is a federal, provincial and territorial government initiative that is overseen by the Canadian Council on Geomatics (CCOG).
5. Natural Resources Canada for Data: <http://geoapps.nrcan.gc.ca/applications>
6. Natural Resources Canada for Publications:

<http://geoscan.ess.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web>

1. [http://earthexplorer.usgs.gov](http://earthexplorer.usgs.gov/): USGS geo-portal for earth observation data
2. GLOVIS: <http://glovis.usgs.gov> The USGS Global Visualization Viewer
3. <http://nest.array.ca/web/nest/sampledata>: European Space Agency Free Data
4. <http://www.vito-eodata.be/PDF/portal/Application.html#Home>: Portal for Free SPOT Vegetation Satellite Data
5. <http://www.gislounge.com/data-warehouses/>: GIS Data Warehouses
6. <http://www.geosage.com/highview/download/GeoSage_Basemaps_Overview_2013.pdf>: World base-maps
7. <http://observe.ivv.nasa.gov/nasa/gallery/image_index.shtml> (Image Gallery)
8. <http://observe.ivv.nasa.gov/nasa/education/tools/tools.html> (Software/Images)
9. NASA-MODIS ascii data: <http://daac.ornl.gov/MODIS/>
10. NASA-MODIS (and other sensors) imagery: <http://reverb.echo.nasa.gov/reverb/>