Final Project

As noted in the class syllabus, we will have a final project at the end of the semester. The project is to bring together what you learned through lectures, and weekly exercises and lab practices and to apply remote sensing technology to your interested application area. This is not a group project. So you need to conduct your final project individually. The objective of the project is to extract land cover information for an area covering the Amherst area. You are required to classify the land cover of the selected area into 3-5 classes such as vegetation cover, water body (lake or reservoir or river) and settlements (residential and commercial landuse). The classification should be conducted by using both images with spatial resolution of 30 and 15 meters). And then you need to compare the accuracy of classifications from using images at different spatial resolutions. This project provide you with a very useful experience of extracting land cover information from satellite images by yourself rather than relying on land cover information provided by the National Land Cover Data (NLCD). The NLCD land cover data are usually updated every decade by the Multi-Resolution Land Characteristics Consortium (MRLC). The project should be implemented in six processes: data preparation, classification training, classification using ENVI, accuracy assessment, analysis classification results and a report of 5 pages.

1. Data preparation

We suggest using a Landsat ETM+ Image acquired after 1998. The multi-spectral images at 15 meter resolution can be obtained by using Pansharpening function in ENVI (Hint: *Transform->Image Sharpening-> PC Spectral Sharpening*). The area of coverage is optional, as long as it covers Town of Amherst. One of the website providing free Landsat ETM+ images is http://www.landcover.org. The multi-spectral image ETM+ might be stored in multiple files. Each file is in the format of TIFF or GeoTiff. Therefore you might have to use a function in ENVI to combine these multiple layers into one file so that you can conduct classification by referencing to all available bands (Hint: *Basic Tools ->Layers Stacking).*

2. Classification Training

Ground truth data samples are usually required in supervised classification. Collection of data samples is very labor intensive and time consuming. Therefore, we don't encourage field data sample collection. You should obtain the training sample using one of the methods below: 1) by referencing to Google Earth image, or 2) by referencing to NLCD 2001 land cover data (http://www.mrlc.gov/).

3. Classification method

The choice of classification methods is your decision. I believe that the classification functions in ENVI would be satisfactory for this project, such as supervised Maximum Likelihood Classification.

4. Accuracy assessment

You need to use a set of ROIs to assess accuracy of classifications for both 15 and 30 meter resolution data. This test ROI should be different from your training ROI.

5. Analysis of classification results

The analysis should be quantitative evidences for answering following questions:

a) Are the total classified areas for vegetation, water body and human settlements the same when the classifications were based on images at 30 and 15 meter resolutions? (Hint: Read histogram of classification result. *Basic tools->Statistics->Compute statistics*)
b) What led to the different classification results?

c) What are the variations between classification at different resolutions for small, medium and large patches on landscape.

6. Report

The final product of the project is a 5-10 page report. The report should be in the format of a scientific article including background information, objectives, data and classification methods, results and analysis, and ended with a summary paragraph which contains a take home message for the reader. It should include following sessions:

1) Introduction - This should be written in non-jargon terms for a broad audience but also deal with the substantive work you plan to do. Why is regular updating land cover information important? Why cares image resolution in classification? An inset map or diagram is extremely useful in describing your study area (i.e., this is required!). You also need to include problem statement/research questions - What are the specific geographic and spatial problems that you are examining in your project? What are your research questions? If you are crafting your research in a hypothesis framework, what are your hypotheses?

2) Data and methods - What types of remote sensing data did you use in your project and where did you download them? What classification methods did you use on the data? What data model or functions you need for implementing your classification?

3) Results and discussion - What are your findings in this project? Are you happy with the results and why? Once you detail the findings, discuss their relevance and applicability. Who might find these results of use?

4) Write a summary about the project as the take home messages so that a reader can tell someone else about your work. It should be short brief about commenting classification process, results, your opinion about the results and further improvement.

Final report is due on May 21, 2009

A word about plagiarism - As noted in the syllabus for this class, I expect students to do all of their own work, and I adhere strictly to the University policy on student academic dishonesty as stated in the Catalog. This applies to article reviews, the text of items in your project, and above all, the underlying research that you are conducting. "Borrowing" techniques or approaches from work done previously by other researchers are fair game; how else do we learn!? However, the report you turn in for your final grade must be your own work in your own words.