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GST 105 - Final Remote Sensing Project Information

Updated: 03.10.2013

Students will complete a project using several digital image processing procedures to generate new image files. The final project allows students *to obtain more hands-on experience with the software and investigate in more in depth one or more concepts* learned during the semester.

Students can use any image remotely sensed image data set that is multi-band (i.e. BGR bands or more). It is recommended that if you are going to do image classification that you use imagery with both color and color infrared bands. Students should access “real” remotely sensed imagery from their workplace, organization, or public domain source (e.g. National Map Viewer, Earth Explorer, CalAtlas, or similar sites, etc).

Keep in mind that this is not a data acquisition class and the easily obtainable imagery is recommended and the imagery needs to be “georeferenced” to a real coordinate system if is not already assigned a coordinate system. Students should be familiar with the area, imagery, and geographic features within the image.

Image Processing Software

Students will use ArcGIS and likely Spatial Analyst and related classification tools), to complete the final projects. If you have unique imagery or imagery from your organization as well as software from your organization, check with the instructor to make sure any software you use from the organization meets the requirements of the course.

Project Deliverables

Students will submit the following digital documents as part of their final project:

1. Sample output files – provide screen shots of the input file(s) and output file(s). The sample output should be embedded into Power Point slides and Word documents. The instructor **does not need to see any actual image files**, but screen shots should be used for the report and power point presentation.
2. Word document (or Open Office document) that documents the project. If possible.



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3. A separate file that contains an executive summary (a one page summary) of the project. The summary information will be repeated in the primary project document as well.

Embedded screen shots of your work are encouraged to be part of the Word document.

- a. Project Summary
- b. Purpose. Include what you hope to accomplish with this project
- c. Description of the image processing tasks and methods used to create the output(s)
- d. Discussion of any difficulties/issues encountered and how you resolved them
- e. Discussion of the output, the interpretation(s) made on the output and/or intermediate image files.

For example, what does the output imagery represent and why is the outcome represented in this form?

Band Ratio of $(IR + R) / (IR - R)$ (Normalized Difference Vegetation Index)

The output image will represent values that result in the value of the ratio described above. This ratio represents a normalized value of IR reflectance values to Red reflectance values from a given sensor and provides a measure of healthy biomass (green vegetation) throughout the imagery. From investigating the Normalized Vegetation Index ratio, it was found in the imagery that resulting high values (bright pixels in the image) have a larger ratio of IR to Red reflectance indicating that healthy green vegetation reflects higher in IR than Red where a higher reflectance of IR wavelengths corresponds to “healthy green vegetation” and thus a likelihood of more biomass for a given area. Comparing this result with other higher resolution imagery in the area for a “summer” image seems to make sense because this area contains many deciduous trees that appear healthy during the summer. In addition, this area contains several golf courses that also have higher NDVI values which would correspond to well managed and fertilized lawn and grassy areas.

- f. What are the conclusions and inferences that can be drawn from the project? Did you expect this outcome? Why/Why not?
- g. What did you learn from conducting this project?



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4. Power point showing screen shots of image processing tasks and samples of image output with a brief explanation and summary slides providing an overview of your project
5. Create a ZIP file of all project documents before submitting them to the instructor.

The documents will be submitted to the instructor by **XXX Date**. There will be no acceptance of late work. If the project deliverables are not submitted by this date, a grade for this portion of the semester's work will not be given. The final project makes up 35% of the student's grade.

Project Schedule

Idea Submission Deadline

The idea submission simply needs to be a written description of your idea submitted to the instructor for review by **XXXX Date**.

The instructor will review the submission and provide feedback on the student's idea before the project is started. The project and deliverables need to be completed by **XXX Date**. The project ideas should be focused and achievable within the last 6-8 weeks of the semester so that students have time to commit to completing the project and his/her other responsibilities. Students should expect to spend approximately 6-10 hours per week working on the project. This time frame is to provide students an estimate of the amount of effort this project should take. The project is expected to take significantly more effort than an individual Unit image processing assignment.

Deadline for Submitting Final Project Documents

Submit all project documents (in a zip file) to the instructor by XXXX Date

Project Overview

Students can choose from a variety of image files to that will be processed using a number of different image processing methodologies. Students will write up their project documents that summarize the project, describe the methods used to complete the project, discuss the findings, issues, and resolutions to their work. Students will create a Power Point presentation that will be delivered during the last class period.



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Grading

Students' projects will be evaluated in the following way.

Submission of Project Idea (10 points)

Image Processing Project Work (200 points)

1. Project idea clearly defined
2. Image Processing Steps/Tasks used
3. Analysis processes used
4. Image output

Documentation (100 points)

1. Project Summary
2. Documentation of Methodology and Steps

The following steps will require image interpretation to be conducted and explained as part of the discussion.

3. Discussion of Image Processing Tasks
4. Discussion of Analysis Tasks
5. Discussion of challenges, problems, issues, resolutions, outcomes
6. Conclusions

Power Point Slides (50 points)

1. Create power point presentation
2. Deliver the Power Point Presentation*

Class Participation (25 points)

Students are expected to ask questions throughout the presentations.*

*These sections can be removed if this class is online or there is no "forum" for students to present their work and virtually "interact" to provide for a question an answer period. NOTE: The points will need adjustment too.



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Extra Credit

Extra Credit will be given for students who incorporate statistical quantitative methods to assess the accuracy of their work. This may include the use of the Accuracy Assessment program used in class or generating sets of statistics that provide some measure of quality in your work. Statistical methods were not discussed in class (other than Accuracy Assessment), but if students have this background, they can certainly use it to their benefit.

Example Project Ideas

The following are potential projects that students can work on. Students can come up with their own ideas if they choose. Other project ideas can be found on the instructor's website at: www.jenningsplanet.com, click on **Student Projects**.

1. Download color and color infrared imagery from the CalAtlas site and run both unsupervised and supervised classification methods and document the methods and findings.
2. Compare "categorizing" urban forest canopies in a) multi-spectral data and b) only one band (black and white) from the 2009 image data. This project will investigate if urban canopy can be categories from a single band vs. the use of BGR imagery.
3. Design your own land cover classification image. Determine the land cover types and minimum mapping unit to use to classify a Landsat image. Use the maximum likelihood classifier. A larger extent of the existing Landsat TM data is available as well as SPOT. National Map Viwer, Earth Explorer, CalAtlas or similar sites have additional Landsat data for download. Some of the data will likely need to be "put together" using the ArcGIS Composite Bands function under **ArcToolbox—Data Management—Raster—Raster Processing—Composite Bands**.

