<u>**Writing Guide for Remote Sensing Labs**</u>

This is meant as a simple guide that you can use to write a good lab report when presenting scientific data. I know it is not always easy, and this may be the first time some of you have had to tackle something like this report, but to do well in this course you need to produce well-written lab reports. The grading of labs 2 and 3 will be increasingly strict since I will expect you to improve with practice. The goal of these write-ups is to help you perfect your scientific writing skills.

<u>**Formatting Help**</u>**:**

Making an essay/report look good is the easy part. Use the following instructions to help format it properly:

- Use Times New Roman 12pt. font
- 1.5 spacing
- Use 1 inch for all margins
- Use a <u>justified</u> alignment for the bulk text
    - Makes text hit the right margin every time
- **DO NOT** indent the beginning of a paragraph
- Be sure to have page numbers
- Have a proper heading, example below.
    - Your Name
    - Student ID
    - Date assignment is due

<u>**Titles and headings**</u>**:**

- Title: 14pt. font, underlined and center aligned
- Subheadings: **12pt, bold and left aligned with a number marking which section they are**

First subheadings should be numbered as so – 1, 2, 3; Any further subheadings should be 12pt not bold, and should be numbered 1.1, 1.2, 1.3 etc. For Example:

2. Methods

2.1 Grey-scale image analysis

<u>**Figures**</u>**:**

- Center aligned
- All images should be placed at the end of the report
- Images added must be used in the text; do not just add a figure. Be sure to introduce it and describe its importance.
- Must have a caption underneath the image
    - Be left aligned, in 10pt. font

<u>**References**</u>:

- Any references go at the end in their own section.

    - This section should be called "References".

REPORT EXAMPLE:

Using the visible and VNIR wavelength region to assess land use in Sydney, Australia, with the ASTER instrument

Executive Summary (Abstract)

- Generally written after the report is finished.
- It is a condensed, concise summary of the report that interested parties can read and understand the main points of the report rather than the entire manuscript.
- The summary must follow the same sequence of topics in the report.
- Should be no longer then approximately 300 words and is written as a paragraph.

1. Introduction

Writing a good introduction can be hard but in the first couple of sentences, focus on a particular aspect of remote sensing or imaging systems that is relevant to the work:

"Visible near infrared (VNIR) remote sensing can have distinct advantages when observing a surface. The Advanced Spacebourne Thermal Emission and Reflection Radiometer (ASTER), is………"

Notice how I wrote out the acronym first before listing it – you only have to do this once. Thereafter you can use the acronym.

Next in the introduction define what the aim of the work was:

"For this work, the aim is to determine the ………….." And then state what it is you want to do.

2. Methods

It is critical to complete this section precisely, but succinctly. Talk about what you did to achieve your goal and make sure to include any techniques/processes you used to complete the lab. For example:

"For this work, we used 3 wavelengths of the ASTER sensor, covering the VNIR part of the electromagnetic (EM) spectrum. These channels have a spatial resolution of 15 m, and have their bands centered at 0.52, 0.63 and 0.76 μm……."

From here describe what you did, and why, but DO NOT GIVE ANY RESULTS!!!!!! Simply state the processes/methods used and then give a remote sensing background. This should describe why you used a particular method. For example,

 "The manual linear stretch was performed in order to……"

Any equations need to be center aligned and written on separate lines with spaces above and below, like this:

"The radiant flux is derived from the Stefan-Boltzman equation, shown as;

$$F = \sigma T^4$$

Where F is the radiant flux, σ is the Stefan Boltzman constant (5.67×10^{-8} W m^{-2} K^4) and T is the temperature in Kelvin."

Continue to do this throughout your methods. Put the tasks in order but avoid the following:

1. "We did this……we then did this……I did this…..I then did this…….." In scientific writing, the passive voice is used. **Thus, you should not use "we, I, etc."**
2. Similarly, do not do the following, "In section I we had to…….in section II we had to……In section III we had to….." Do not list, this does not sound professional.
3. Do not state results! If the stretch was designed to increase contrast that is one thing, but do not state what it did to your image. Leave that for the results section.
4. Check to make sure that you included everything that you did but keep it succinct. Do not give me unnecessary sentences, such as "I clicked the file open and opened the image in ENVI". Be precise and do not state the obvious. I do not need to know which windows you opened or what buttons you pushed, only the complex methods you used to formulate your results.

3. Results and Analysis

Simply write about the title of this section. List the results and then give a remote sensing reason for why this happened. For example,

"Upon assigning the bands from longest to shortest wavelength to form an RGB color composite, it was shown that……. This can be explained by …….. (shown in Figure 3)."

State an observation you made *and give a reason based on remote sensing theory for it*. If you have figures refer to these in the text, but make sure you fully explain what the image is showing in the caption. It is important that you state in a caption, **which sensor** acquired the data, **which wavelength** region is being used and **what it shows**.

4. Conclusions

This is a way of rounding things off. State your major findings and any other possible uses of the techniques you have employed. Make sure to state any major "conclusions" you interpreted from the results.

5. References

This is optional. If you have any, list them in alphabetical order using an appropriate referencing style. If you are not sure how to do this, read any major journal paper to see an example.

Syntax and General Tips

This is a quick list of scientific things you need to remember when writing:
1. Check your units! Make sure they are consistent and understandable.

2. Write an acronym out in full the first time and then state the acronym (only needs to be done once).

3. Reference figures in the text and use it to make a point, do not just describe it.

4. Make sure to correctly use words specific to the subject you are studying! For remote sensing, a few words to keep in mind are: colors, sensor/satellite, image/picture, Digital Number. Make sure you are correctly using reflectance/emissivity/transmission!

5. Do not leave your reports till last minute! Make sure to leave enough time to read over your work.

6. Do not use contractions.

7. Please upload the final lab write up to Canvas. This makes it easier for me to grade and make comments.

8. If you do not understand something, ask me about it.

9. Lab reports should be no less than 2 pages of text and no more than 3 pages of text.

   a. This does not include the pages with images or your references.

One final hint is that things listed on the handout are REQUIREMENTS, but that does not stop you from providing supplementary images and additional points of interest.

Report Grading
- Lab Handout-   10%
- Layout-   20%
  - Proper organization and formatting of report; outline is very helpful for this part

- Grammar/Writing Style-   25%
  - Clear concise writing is required for scientific reports.

- Report-   45%
  - All sections present

- o   Required figures included
- o   Minimum of 2 and up to 3 pages in length for text; the figures can be placed as extra pages at the end of the text

- Extra Credit: some labs may include extra credit