

Writing Guide for Remote Sensing Labs

This course will give you training in producing well-written lab reports. You can use this simple guide to write better reports when presenting scientific data, which is not always easy especially if it is the first time you have done this style of writing. After lab 1, the grading of labs 2 and 3 will be increasingly strict and worth more because you should improve with practice and incorporate the grading feedback.

Formatting:

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 for body text
- 1.5 spacing
- Use 1 inch for all margins
- Use a justified 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
 - Lab number
 - Date assignment is due

Titles and headings:

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

Figures:

- Center aligned and placed at the end of the report
- Be sure to introduce the figure in the text and describe its importance.
 - Include the figure number in the body text
 - For example - This particular spatial trend can be observed in some regions (Fig. 1)
- All figures must have a caption with a figure number, a descriptive title and mentions of the details of the image if necessary
 - This should be left aligned, in 10pt. font

References:

- 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 (e.g., intro, methods, results and conclusion)
- Should mention the important findings in a line or two
- Should be no longer than 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 Spaceborne Thermal Emission and Reflection Radiometer (ASTER), is.....”
- Notice how the acronym is written out 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. Please

include all important methods which helps you in understanding the results better and plays a major role in obtaining the results. 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 use 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 manual linear stretch was performed in order to.....”
 - “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 ($5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^4$) 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. Do not write the full file name with their extensions (for example - reflectance.dat) when writing the report. Instead say the reflectance image of this region was loaded.
 3. 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.
 4. Please provide details of the image - the location and if any dates are available in the introduction section. Don’t have to include such details in the abstract since it would be short.
 5. If you are using a new concept in the lab like NDVI or something else, please introduce the concept in the introduction in a few lines.
 6. **Do not state results in the methods section!** 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.
 7. Check to make sure that you include everything that you did but keep it succinct. Do not write 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.

8. **Make subdivisions for methods and results** - you can follow the subdivisions in the lab handout or create your own. Don't put chunks of text in the results and cram everything in. Making subdivisions makes the report look more professional and easier to read.

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 that refer to these in the text, 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. Also, mention in a few lines how the methods/concepts you used in this lab helped you in understanding the results better.

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 them to make a point, do not just describe them.
 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.
 5. Make sure you are correctly using reflectance/emissivity/transmission
 6. Do not leave your reports till the last minute! Leave enough time to read over your work.
 7. Do not use contractions.
 8. Do not use superlatives.
 9. Please **submit the final lab report and the lab handout in Canvas as separate files**. Make sure you have attached all the images in the report.
 10. If you do not understand something, ask me in class, email me or come to my office hours.
 11. Lab reports should be between 2 – 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 items of interest in your report.

Report Grading

- Lab Handout **5%**
- Figures and Captions **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 **40%**
 - *All sections present*
 - *Required figures included*
 - *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*