

Reports in AST2210

1 Basic layout

In scientific journals research is usually presented in the form of an article. Most commonly (though there will be variations) this means following a format consisting of an abstract, an introduction, a section on the methods used, a section describing the results and finally a discussion of these, placing the results in a wider context.

In the present context, this format is a nice orientation on what needs to be included for the various exercises you complete in the labs. On the other hand, **since the actual laboratory exercises are distinct and numbered, it will be necessary to weave the exercises into a greater-whole instead of answering them one-by-one as you performed them.**

In practice your report should follow this general layout:

- **Abstract: The Quick Overview**

Here the article is briefly summarized, mentioning some background, the methods and data used as well as notable results - keep it short and to the point.

- **Introduction: The Why**

Why are we doing this exercise, what are our assumptions, what do we want to accomplish?

- **Methods: The How**

How did you obtain the data, what methods did you use? Describe your work process. If you performed an experiment using specific equipment, describe your setup.

- **Results: The What**

What were your clear-cut results? - Present them in a clear and concise manner, waiting with the discussion of them for later. Here you present calculations, figures and tables of data, output of code, etc.

- **Conclusion/Discussion: The Meaning of it all**

Were the results what you expected? Are the results significant? - meaning; are the results clear, or are they open to interpretation? How certain can you be of them? What do these results mean in a wider context?

2 Results/data to include

A guiding principle on what to include in reports is this: **the most important thing is to demonstrate that you performed the exercises properly and understood the meaning behind each exercise - both by text using the format described earlier, as well as by which figures and other content you select to highlight your results. Convince the reader that you understand the subject matter at hand and that you did everything required of you by the problem text.**

Directly asked for data/images/results should of course always be included. When asked for image comparison, examples of this should also be included. Not all images must be included directly in the text if many are similar. Extra images may also be included in an appendix.

Figures and Tables

When including relevant figures they should be numbered and have a caption describing what the figure depicts. The images or plots themselves must have labeled axes with appropriate units of measurement whenever possible. Every figure not included in appendices **must individually be mentioned** in the text.

Including tables follows many of the same conventions as for figures. A table should have a caption describing its content, as well as having clear labeled rows and columns with units of measurement whenever possible. Again, every table within the main body of text must be mentioned in the text itself. Examples of a figure and a table respectively can be seen in Figure 0.1 and Table 0.1 respectively in Section 4.

Calculations

Present calculations separate from the main body of text if they are more than one line long. Explain your reasoning, and try to assess the uncertainty of your calculated values. For example, when doing image analysis include an estimated error in pixels due to image-fuzziness, uncertain borders of objects, etc. An example of an equation is given in Section 4. A quick guide for uncertainty calculations can be found here and a very basic one here. Since many will not have encountered these types of calculations before, make sure to check out these resources and/or ask questions at the groups/labs or by email.

Code

Larger code you used to solve numerical problems should be included in the report as an appendix. You may use code-snippets inside the text to demonstrate specific problems. It is not required to include smaller one-line statements from your IDL session however. An example of a code snippet within the main body of text is included in Section 4 together with an example of loading the entire corresponding file. The `\lstinput` and the `\lstinputlisting` commands in LaTeX can be used for displaying snippets and entire files respectively.

3 General reminders

- All reports must be handed in via email in **pdf** format to `ainar.drews@astro.uio.no` and cc'ed to `h.k.k.eriksen@astro.uio.no`.

Files must be named `FirstName_LastName_LabNumber.pdf` to avoid confusion due to similar filenames. Numbering is simply what number of lab from semester start is being handed in.

- It is advised to use \LaTeX to create your reports. \LaTeX is a document markup language, and offers a wide variety of options to customize texts. A sample file for writing your reports following the article layout is available on the course website, and this \LaTeX source code for this document will also be made available as a start-help for the interested. It can be compiled to pdf on University Linux machines with the command `pdflatex report_reminders.tex`. \LaTeX documentation can be found here, otherwise, as always: "Google it!".
- Do **not** copy-paste terminal output directly into the middle of text - values output by code must be presented in a clear and professional manner (figures and tables).
- Maintain a professional writing style, this means avoiding wordings like "we just did as the exercise told us", "I have no idea what this means", "this exercise was too hard and I didn't do it" etc.
- If unable to complete an exercise or complete a calculation or coding problem for whatever reason, explain your reasoning in how you **would have** solved it if able, and what you would expect as a result - speculate, and demonstrate what you understood about the exercise - try not to leave the relevant parts blank.
- When comparing results with other values, remember to be consistent with units.

4 Examples of a figure, a table, an equation, a snippet and code-listing

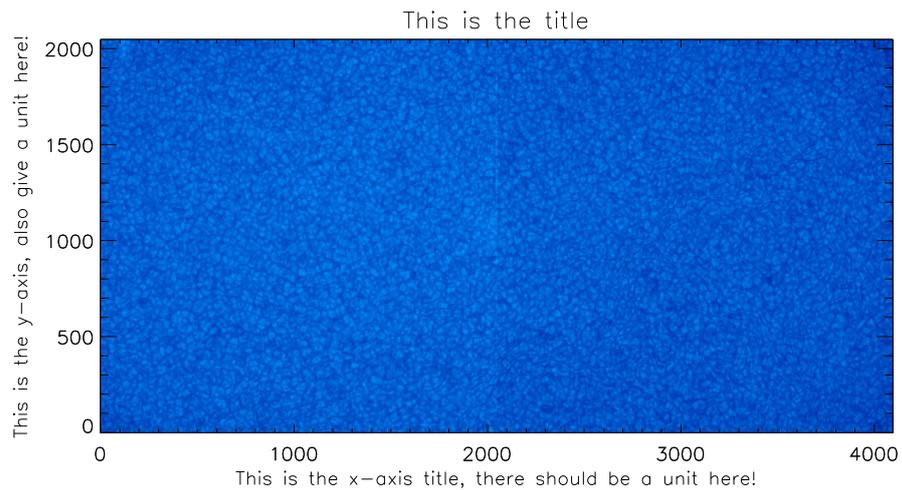


Figure 0.1: An example figure with an image output by `saveimg`.

Experiment nr.	Value 1 [unit]	Value 2 [unit]	Value 3 [unit]
1	2.00	3.86	10.1
2	1.58	4.23	9.99
3	2.12	1.34	11.2
4	2.10	3.44	12.0
5	3.11	4.44	11.3
6	1.99	6.66	8.88

Table 0.1: Three measured values for 6 fictional experiments, where the experiment would be explained in the text.

An example equation for calculating a pixel offset with uncertainty:

$$\begin{aligned}\Delta x &= x_2 - x_1 \\ &= (100 \pm 2) \text{ [pix]} - (80 \pm 2) \text{ [pix]} \\ &= (20 \pm 4) \text{ [pix]}\end{aligned}$$

An example of a snippet:

```
my_array = [1, 2, 3, 4, 5]      ; An array I made
my_sum = 0.0                    ; This will store the sum of
                               ; my array
```

An example of listing the entire `test_prog.pro` from which the snippet is taken:

```
my_array = [1, 2, 3, 4, 5]      ; An array I made
my_sum = 0.0                    ; This will store the sum of
                               ; my array
for i=0,4 do begin
    ; I loop through all 5 indexes of the array
    ; and sum the elements
    my_sum = my_sum + my_array[i]
endfor
; Finally I print the sum
print, 'The sum of the array is:', my_sum
print, a_variable
end
```