AMATH 563: FINAL PROJECT TEMPLATE

SUPER-INTELLIGENT AGENT 1, SUPER-INTELLIGENT AGENT 2,
CHATGPT-POWERED AGENT 3

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Abstract. Your report should contain a brief, 100 word abstract describing what is contained in the document and what you did. **The entire document, including references should be 10 pages max**. This template is a general format for what a report may look like. You don't have to keep all of the sections or use the same titles, so feel free to modify things as you see fit.

1. Introduction and Overview

Here you will give a brief introduction to the problem you solved. Including some discussion of relevant literature and background.

Make sure you use the correct citation commands (i.e., `\cite`) to keys from your bib file like this [2]. If you want to cite more than one reference simply use [2, 1]. You can grab latex citations from Google Scholar. Just keep in mind that they often need to be cleaned up.

Your report will be assessed based on

(1) General quality and cleanliness of the report (10%). Examples include:
- Does the report have all relevant/related sections?
- Are there typos? is the grammar/english sufficiently good?
- Are figures high quality? are the axes labelled and readable?
- Is notation consistent?

(2) General quality of the content (25 %). Aim for a journal level publication:
- Are relevant details of thoery and algorithms sufficient?
- Quality of numerics and the pertinent discussions and conclusions.
- Did you achieve the goals you were aiming for?
- Discussion of observations and interesting behavior from your experiments.
- Don't forget to talk about difficulties and challenges.

2. Theoretical Background

You dedicate this section to the theoretical background of the methods and frameworks that you used in your project. You can create equations like this

$$f(x) = \int_A \sin(\pi x) dx.$$

Do not label your equations unless they are referenced in the text. In that case simply use

$$-\frac{\partial^2 u}{\partial x^2} = \sin(\pi x). \tag{1}$$

Also look up the `align` or `aligned` environments if you want multi-line equations. You can then reference your equations in text using the `\eqref` command as such (1).

Date: June 9, 2023.

3. Algorithm Implementation and Development

Here you discuss the algorithms and software packages that you used. Do not copy paste code and make sure you cite the packages properly. You may include pseudo code or algorithm environments such as this, to describe new methodologies that you may have developed.

4. Computational Results

This is perhaps the most important section of your report. You want to dedicate more space here and present your numerical results in a clear, concise and meaningful way. Also include a discussion of your numerics. Think hard about how you can use your space most efficiently. For example, include subplots and multiple error curves on the same plot etc. You will most definitely need tables and figures. So here is an example.

row 1	column 1	column 2
row 2	column 1	column 2
row 3	column 1	column 2

Table 1. Don't forget to include a caption for your table. Say a few words about what is being shown.

Make sure your table is labeled and referenced withing the text using `\ref` as such Table 1. In fact, you can use `\ref` to cite anything else in the document such as sections (ex. Section 1). This will create hyperlinks in your pdf after compilation and automatically update the numbers and tags whenever you change anything.

Figures are very similar to tables. Here's an example:

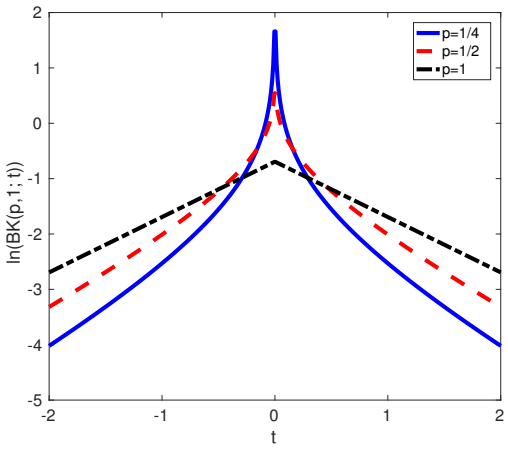
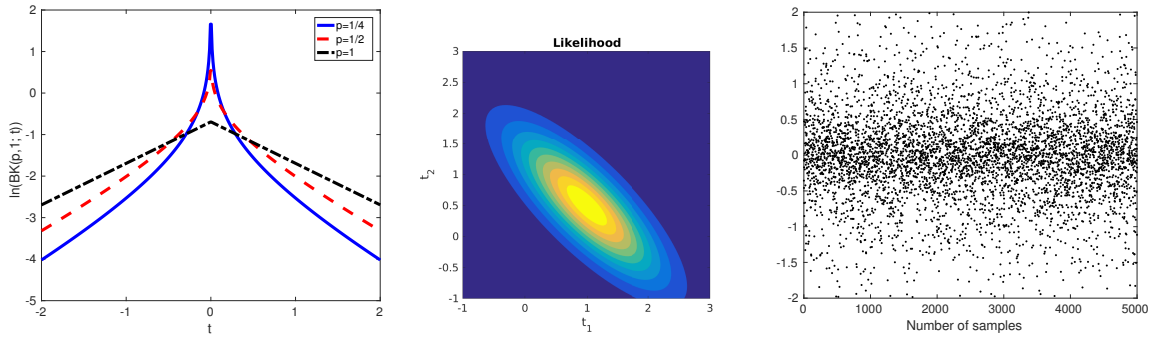


Figure 1. Include a descriptive caption for your figure. Also make sure all legends, axis labels, and titles are large enough to be readable. You might have to reproduce the plots from Python or MATLAB with larger fonts for this purpose. It can be annoying the first time you do it but it is crucial.

You may also need to include multiple figures:

Once again, make sure all your figures are referenced like Figure 1 or Figure 2a in the text body of the report and discussed in detail. This is where you will make observations about your results and we will look at these very closely.

Also note, I am using PDF figures. These give you the best looking graphs but PNG works well too. I advise staying away from JPG as it always looks weird and low quality. Both Python and MATLAB can output figures in PDF or PNG.



(A) First subfigure (B) First subfigure (C) First subfigure

FIGURE 2. Caption for entire figure. You don't need to use captions for subfigs so feel free to eliminate the subcaption texts to just have the A, B, C labels.

5. Summary and Conclusions

Wrap up your report with a brief summary of what you did and what you discovered. Finish with some conclusions and possibly future directions if any. You can also replace this section with "Discussions" where you present a more extensive discussion of your findings.

Acknowledgements

Make sure you you clearly state any help you received including collaborations with your peers. Help from TAs or other mentors, professors, etc that helped you with your assignment. Here's a formal example:

The author is thankful to Prof. X for useful discussions about the QR algorithm. We are also thankful to Dr. Strange for suggesting the JAX software package for automatic differentiation. Furthermore, our peer Jean Grey was helpful in implementation of spectral clustering in Python.

References

[1] F. Author. *Title of example book*. Name of Publisher, 2077.
[2] F. Author and S. Author. Title of example article. *Name of Journal*, 1(1):1–10, 2077.