AMATH 582: HOMEWORK 1

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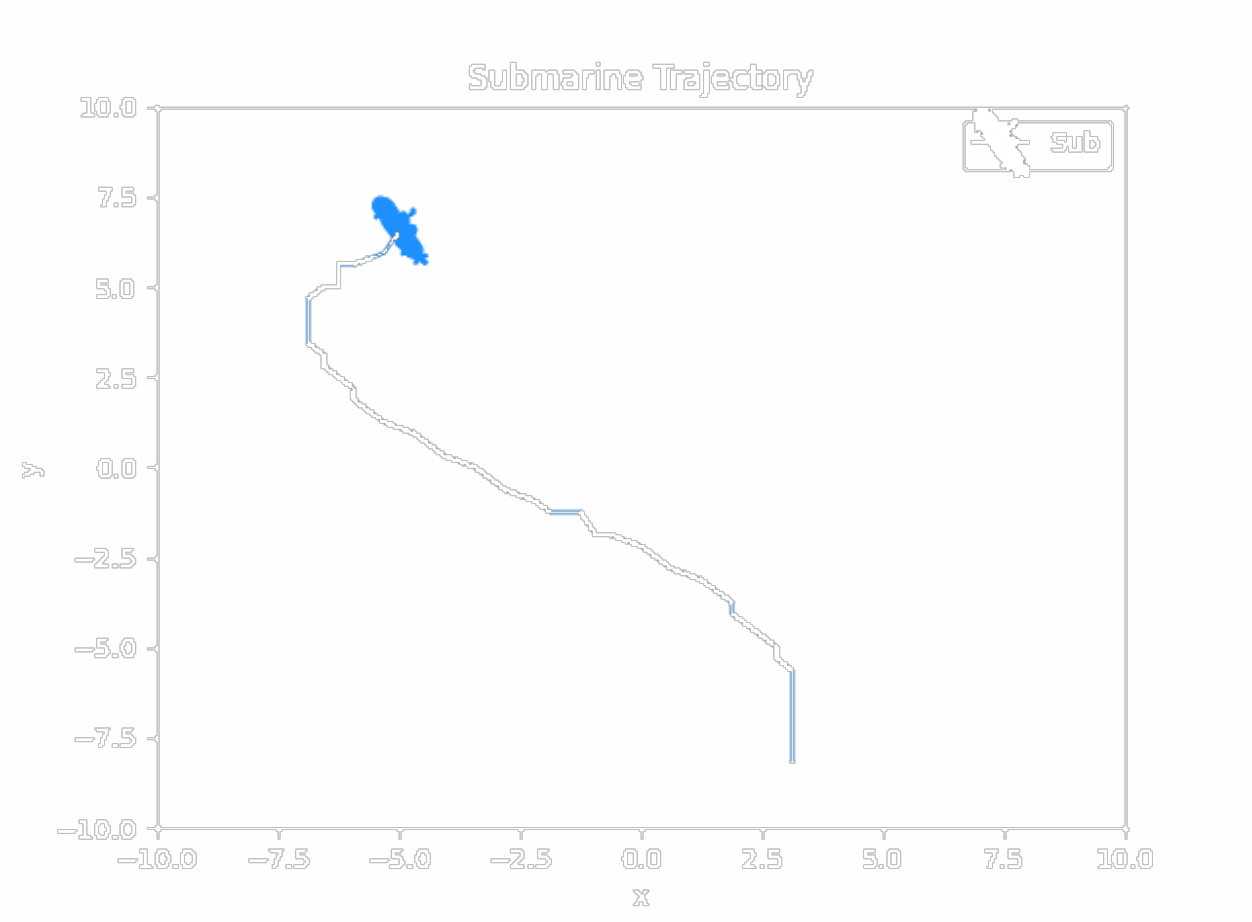
Abstract. **TODO:** Your report should contain a brief, 100 word abstract describing what is contained in the document and what you did. **Don't forget 6 pages max**.

1. Misc Notes

I am currently trying to visualize the data more on my own with the packages provided by matplotlib and plotly. It is confusing to me a bit since we are really visualizing something that has 4 dimensions. There are signals or values which are occurring in a 3 dimensional space.



Trying

Date: January 17, 2025.

2. 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 [**?**]. If you want to cite more than one reference simply use [**?**, **?**]. You can grab latex citations from Google Scholar. Just keep in mind that they often need to be cleaned up.

3. Theoretical Background

You dedicate this section to the theoretical background of the methods and frameworks that you used in your homework. This is not meant to reproduce material from the lectures or references you used but rather to demonstrate your understanding of the mathematical foundations of the methods and algorithms. You can create equations like this

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

You do not need to 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).

4. Algorithm Implementation and Development

Here you discuss the algorithms and software packages that you used. Not much to it. Just make sure you cite the packages properly and avoid including code. You are welcome to use LaTeXpackages that are specifically designed to show algorithms such as this, but it is not always worth the effort and real estate.

5. 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. Ask us for advice when the time comes.

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 2). 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:

You may also need to include multiple figures:

Once again, make sure all your figures are referenced like Figure **??** or Figure **??** 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.

6. 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.

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.