Chapter 26

Jungle Bridge Report Style Guide

For Jungle Bridge, we'll be asking you to generate a report as you go for the project. This guide is intended to be used as a reference for assembling elements of your final report, and also expresses our expectations of writing quality for this assignment. As always, please reach out to the teaching team if you have any clarifying questions about the assignment, rubric, and submission instructions.

26.1 Overview

The intent of writing a report for this project is two-fold: (1) generate an artifact of your effort and approach(es) to a problem, and (2) practice technical writing and documentation design.

Generating an artifact means that at the end of this project, there is a tangible "thing" you can take home or share with others (i.e., through a portfolio) – your report. A high-quality report will stand independent of the originating project prompt and be a self-contained document. Thus, an effective artifact will incorporate all evidence of the work that was completed, as well as provide context for all of that evidence so it can be understood by an external audience (or you in a few months time).

Technical writing and documentation is a significant part of the day-to-day work of an engineer. Engineering is inherently collaborative and cooperative – writing and documentation serve to keep you and everyone you work with informed about design decisions being made (and why), progress towards a particular goal or outcome, debugging steps for a complicated system, considerations for the next prototype of a system, and so on. Documentation shared amongst a team can vary in formality, but should always provide the context for the document's creation, the key pieces of information or evidence to convey, and whether there is follow-on work to be completed. The complexity of modern engineering systems dictates the use of precise language when describing design decisions or goals. In technical writing, "language" incorporates visual representations of data or objects (e.g., graphs, annotated models) and mathematical formulations of key concepts.

For the purposes of this project, we would like your report to formally convey the following:

- The basis of the project (what is the assignment in your own words, key assumptions)
- A description of your approach to completing the project, with motivation or reasoning explained.
- Evidence of project completion (e.g., images, figures, written responses to specific prompts, code snippets, etc.).
- Key take-aways and/or any remaining questions

The rest of this guide provides some information on how we suggest you might organize your report, and best practices when it comes to writing, embedding figures, and incorporating any additional information into your artifact.

26.2 Organization

This section provides a *suggested* format for organizing your report. These elements are largely generic, so no matter how you ultimately choose to organize your report, we will be looking to see that these ideas are captured and documented.

26.2.1 Title and Authors

Please provide a title for your report and an authors list (preferred names). You may also decide to put an attribution statement at the top of your report (see details in this document).

26.2.2 Overview

Please provide the context and motivation for the project, in your own words. *Do not copy and paste from a project prompt.* In an overview, you should also preview what methods you used and key results.

26.2.3 Methods

This will likely be the bulk of your report writing; a methods section describes your approach to the project. It will contain equations and potentially explanatory figures, as well as connecting text between different ideas. While we will be scaffolding this project with a particular sequence, your methods section does not need to be ordered temporally with the order that you completed the work. Some information specific to Jungle Bridge that you may want to convey in your methods section includes:

- Process for measuring material properties (annotated figures, data table, etc. may be elements of this description)
- Bridge assembly (annotated figures may elements of this description)
- Modeling the bridge position (equations and code snippets may be elements of this description)
- Method used to compare the experimental and the modeled bridge position (equations and code snippets may be elements of this description)

Importantly, a methods section is *not* a place to share your results. Rather, it is a catch-all of all the processes you developed and implemented, and your rationale for using those approaches.

26.2.4 Results and Synthesis

This is where all of your evidence of implementing the methods (and to some extent, evaluating those methods) is collected. This section may contain data tables, graphs, and images. Its aim is to convey the results of your methods, and provide some analysis of those results: for instance, why is it important that a particular graph yielded a certain trend and what does that tell us? Some results you may want to convey in this section for Jungle Bridge includes:

- Material properties of your bridge components
- The assembled bridge
- Figures comparing the assembled (experimental) bridge with the modeled bridge
- Evaluation of the modeled bridge compared to the experimental results

26.2.5 Concluding Remarks

The report should be concluded with a summary of the key methods and results (i.e., key take-aways), an evaluation of the project from your perspective, and any remaining questions. Concluding remarks can also be a great place to explain any extenuating circumstances for the project (e.g., some of the original rubber bands broke, and that impacted the final prediction;) or another place to detail the attributions of each team member.

26.2.6 Attribution

As we will be working on projects in teams, please be sure to list the names of all members somewhere in your report (typically at the top; feel free to give your report a title as well!). We also recommend the practice of adding a brief attribution statement in your report, at the end, which lists the members of the team and aspects of the report they may have been primarily responsible for or generally contributed to. Some example attribution statements:

- "Both team members contributed equally to all aspects of this project and report."
- "While both team members engaged with all aspects of the project, X primarily worked on the regression portion of the project and figure generating, and Y primarily worked on the gradient descent portion of the project and narrative writing in the report."
- "X worked on regression, gradient descent, constrained optimization, and writing the corresponding parts of the report. Y worked on regression, unconstrained optimization, and figure design for the report."

26.3 Style

This section is all about *how* you write your report, as opposed to *what* you're writing about.

26.3.1 Headings

Headings are short-and-sweet signposts for your writing. Please use headings and subheadings to convey when you are transitioning into a different discussion. A skim of headings in a paper should give a reader a good sense of all the material that will be covered; headings should also be useful bookmarks for anyone looking for a particular piece of information to go back and re-read or review. Headings will generally not convey particular results or methods; rather, they will convey themes. Examples of some possible headings for a Jungle Bridge report include:

- Bridge Assembly
- Concluding Remarks
- Assumptions
- Results
- Project Description
- ...and so on...

Unacceptable headings would be examples like: "Material Properties of Each Rubber Band We Measured Using Different Weight Profiles" (too long, too specific); "Our Model and Experimental Bridge Data Were a Match" (results embedded into the heading); "It Worked" (results-oriented and too vague and colloquial to understand what this might be in reference to).

26.3.2 Text

The methods, analysis, results, and discussion of your work will all be written underneath your headings. 'Text' here refers to narrative writing, embedded symbolic equations, code snippets, and numerical tables.

Narrative writing should be descriptive and explanatory, and make plain your thinking process while completing a project. It should not just re-hash the procedure for a project, but expand upon it – why is performing a particular analysis useful? how did you derive this equation? what is the interpretation of a particular result?

Equations

Some ideas are not necessarily well-described with narrative text. For instance, particular mathematical procedures (e.g., "taking the derivative of a function") are more precisely described symbolically through an equation or set of equations. When used, equations should be on their own lines (and ideally numbered/labeled), and the variables/values in the equations introduced in the text directly preceding or following the equation. Symbols should be used; rather than the word "theta" use θ. Since you define your symbols, and will describe them in your text, choose symbols that are clear shorthand: rather than x_{right} let the symbol simply be x_r. An example of how to render an equation follows, where x is a vector variable of real numbers, and $f(x)$ is a vector-valued function:

$$\frac{df(x)}{dx} = 2x - 5 \tag{26.1}$$

Code Snippets

As the projects we work on in this class have a significant implementation component in MATLAB, it can be helpful when describing your methods to selectively include code snippets. If you find that incorporating code into your explanations is helpful, we recommend the following best practices:

- Do not copy and paste all of your code in giant blocks without commentary. Include code comments or narrative next comments if you are copying over large sections of code.
- Try to limit code snippets to single lines or single function calls; you can incorporate snippets like this directly into a narrative paragraph.
- When adding code to your report, render the text in some other font or style so it is clear to the reader that you are providing a code snippet.

Tables

You may have numerical data that you'd like to convey in the report, and writing it in a paragraph would be too cumbersome or unclear for a reader. Tables are a great organizational tool for numerical data (or even categorical data and lists!) that you are encouraged to use when appropriate. A table should have clear row and column labels, be given a table number and caption, and be cited somewhere directly in the text you write (see Tab. 26.1).

Example header	Example header 2
Some data!	Some data!

Table 26.1: This is an example table.

26.3.3 Figures and Images

Graphical representations of data, annotated diagrams, or images are en excellent supplement to written text, since they can convey complex information and analysis in a relatively compact format. You should feel empowered to include whatever graphical imagery is necessary to explain any key points you would like to make. When adding a figure to a report, there are some key practices you should follow:

- The figures should have an appropriate resolution to be rendered clearly in your report (figures at 300DPI and approximately 5 x 5 inches in scale may be a good rule of thumb here).
- For graphical figures, all axes should be labeled, the plot and subplots should be labeled, the legend should be complete, and any annotation added in post-processing should not block any portion of the data being visualized. Figure captions should include a brief description of what is in the plot, as well as brief interpretative remarks.
- For diagrams, all key components should be labeled clearly in words or symbols, which are then defined in the figure caption. The figure caption should summarize how to interpret the diagram, and any other key pieces of information.
- For images, annotations can be helpful in addition to descriptive figure captions that directly describe what is being rendered in the image and its interpretation. For instance, a caption like "The Bridge" is not very useful; instead consider "The bridge we assembled, centered in the image, with 5 weights and 6 rubberband members with properties recorded in Table X."
- When included, figures should be directly referenced in the text of the report. For instance, see Fig. 26.1.

26.3.4 References and Citations

In technical documentation you may write for other classes or in the workplace, citing any sources you used along the way is an essential practice. While we do not explicitly require you to use outside sources in this project, if you independently use outside sources to better understand a particular topic or implement a certain piece of code, please reference them in the text (e.g., with a style like "statement that needs cited (citation author, year)" or "statement that needs cited [Citation number]") and provide a full citation at the end of your report. You can choose the reference and citation format (e.g., MLA, APA, IEEE – this author recommends IEEE).

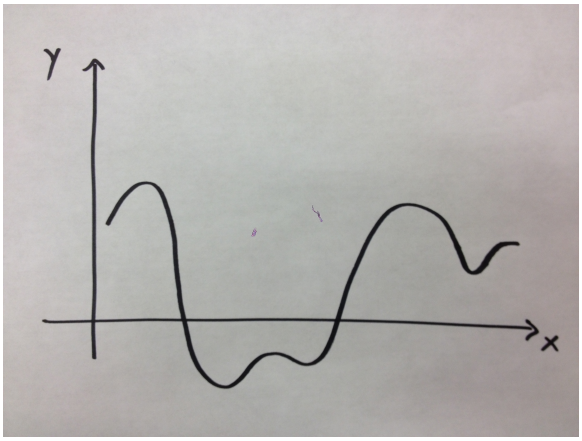

Figure 26.1: A placeholder figure in this style guide, to illustrate how to embed a figure in a report and reference it in the text.

26.4 Resources

You can prepare your report in any text editing software you are most comfortable with. For collaborative report writing, cloud-based services like Google Docs or Overleaf are good options. In academia and industry, many reports or papers are written in a typesetting language called "LaTeX" which is how we write many of the documents we generate for this class. This may be a great opportunity to learn it!

For generating figures, consider using a vector graphics editor like Inkscape, Adobe Illustrator, Gimp, and so on. You can also generate figures using cloud-based software like Google Slides or Google Drawing.