ME 599 Software Development for Engineering Research

Project Report Guide & Rubric

Based on your submitted project proposal, you should prepare and submit a project report that describes your work, written like a research article. There is no length requirement, but your article should include all the described pieces (around 5–10 pages is totally reasonable, and longer is not necessarily better).

Report submission requirements

- The report must be submitted as a PDF. Format it like a journal or conference article from your research area. I recommend using LaTeX and using available templates (e.g., APS RevTeX class, Elsevier elsarticle class, or the built-in article class—just please do **not** use two columns), but you can use whatever you prefer. The specific format you choose is less important than the article looking professional.

- The report should include a title, your name and affiliation, and sections such as

    1. Introduction and Motivation: introduce the need for your software package; what problem is it trying to solve? This should be relate to your research. This section should also cite relevant literature.

    2. Methods: this section may include governing equations (if appropriate), numerical methods or other methods used, description of the physical problem you are considering, etc. What is needed to explain what your software does? This should not include the software details, as those go in the next section.

    3. Implementation: this section should describe the software design, layout, and functionality. What modules and classes comprise your software? How does someone run it, and how do they interact with it? (e.g., command-line arguments, input file, GUI). What packages does your software depend on (with appropriate citations)?

    4. Results: this section should show sample results based on the functionality of your code. This may involve figures/screenshots.

    5. Conclusions and future work: summarize and describe the overall functionality of your software. How can this software evolve, what else would you want to add to it moving forward? (Or what would you want others to add to it?) How do you see this being used?

- Please ensure you cite software you use or rely on (such as dependencies). **This includes your software**—make sure you archive and cite the final version of your software as we discussed in class. For software citations, AAS's guide is a good reference.

Grading rubric

Report Elements	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
Structure	Paragraphs are poorly organized; use of sections is illogical and hinders document navigation	Paragraphs are usually well-organized; use of sections is logical and generally allows easy navigation of the document	All paragraphs are well-organized; use of sections is logical and allows easy navigation through the document
Figures, Tables, and Equations	Figures, tables, and equations are not clearly or logically identified and fail to support the text	Some figures, tables, and equations are clearly and logically identified and adequately support the text	All figures, tables, and equations are clearly and logically identified and strongly support the text
Formatting	Document is formatted poorly	Formatting of the document is generally consistent and adequate	Formatting of the document is professional
Mechanics	Sentences are poorly written; there are numerous incorrect word choices and errors in grammar, punctuation and spelling	Sentences are generally well-written; there are a few incorrect word choices and errors in grammar, punctuation and spelling	Sentences are well-written; there are no incorrect word choices and the text is free of errors in grammar, punctuation and spelling
Introduction & Motivation	Fails to provide an overview, discuss relevant literature, and define the scope of the work	Provides an adequate overview, discussion of literature, and explanation of the scope of work	Provides a thorough overview and discussion of literature, and thoroughly defines the scope of work
Methods	Unclear what the concepts are behind software	Some discussion of ideas, equations, etc. behind software	Thorough and clear description of ideas behind software
Implementation	Little description of software or its dependencies. Missing software citations.	Some description of the software design and dependencies.	Thorough and clear description of the software design and its dependencies. Consistent software citations.
Results	Fails to show sample results from the software	Minimal presentation of results from the software.	Thoroughly presents and discusses results from the software package
Conclusions	Does not summarize project, or connect work to ongoing/future research.	Some summary of project. Mentions potential future work.	Summarizes project, describes potential future advancements, and shows integration with research.

Software rubric

Software Elements	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
Installation	Package does not install	Package installs with some issues, using local source files	Package installs without error using pip or conda
Documentation	Minimal or missing README, that does not have software description, examples, or installation instructions	README includes some description, one brief example, and some information about installing.	README, possibly supplemented by Sphinx documentation website, includes clear description of the software, example(s), and installation instructions
Tests	Minimal or missing test suite, or tests fail.	Software has a test suite, which runs and (mostly) passes.	Test suite runs without issue and passes, and software repository has continuous integration set up
Examples	No examples, or the examples do not run as described.	At least one example that runs as described.	Examples run without issue, based on given instructions. Multiple examples that demonstrate breadth of software.
License	Missing license, or non-open source license.	LICENSE file present, with open-source license.	n/a
Interface	Unclear how to run software, or confusing interface	Software runs following instructions	Software runs via clear command-line or graphical interface, possibly using (documented) input file

General writing tips

- Tense is important and should be consistent. A good convention to follow is to use past tense to describe any actions you or

- Active voice is much more interesting to read, and concise. Use interesting, active verbs and avoid nominalizations (meaning taking verbs and turning them into nouns—yes, use of this word is ironic. For example, "We analyzed the data" is much better than "We performed an analysis on the data". Though sometimes these can be useful when summarizing action of a previous sentence, like "We analyzed the data. This analysis demonstrated the need for additional experiments." In this case the second sentence still uses a strong active verb, though.)

- First or third person singular is also absolutely fine, though you should avoid filling your article with "I did this" and "I did that". The methods section is the only place where some passive voice is acceptable, just to avoid repeating phrases like that.

- There are some good resources out there on writing style, such as https://cgi.duke.edu/web/sciwriting/index.php

- Here is a nice guide on writing a research article: https://ceprofs.civil.tamu.edu/ssocolofsky/downloads/paper_how-to.pdf