

# Generic Project Guidelines

CMSC-641 Algorithms, fall 2017, Alan Sherman, UMBC

This handout provides specifications and advice broadly applicable to course research projects. Topics include proposals, drafts, final reports, presentations, and peer reviews of these items.

## Proposal

The proposal must clearly explain what you are doing, why you are doing it, what is new about your project, and what is the significance of your project. The proposal should include a critical review of previous related work, specific aims, a plan of attack (how you plan to accomplish your aims), and a bibliography. It should also include a realistic schedule, budget, a list of deliverables, and a discussion of any foreseeable difficulties and how you plan to overcome them. The proposal should follow the generally-accepted guidelines for computer science research proposals—for example, as described by the National Science Foundation on their web pages. I recommend that you evolve your proposal into your final report, reusing as much text as possible.

The proposal must be organized as follows:

### *(a) Project Summary Page (one page)*

Include the following summary information:

1. Informative project title. (do not title your project “CMSC-641 Project.”)
2. Date.
3. Investigator names, affiliations, and email addresses
4. Short phrase describing the general area within algorithms of your project.
5. Keywords.
6. Brief 1-3 sentence project description. Distill your proposal to one focused, well-defined question.
7. Assignment of responsibilities to group members (if group work).
8. Total budget
9. Brief list of deliverable

### *(b) Executive Summary (one page)*

The executive summary is like an abstract; it is a substitute for the entire proposal. Repeat the title, date, author names and affiliations, and project keywords on the executive summary page

### *(c) Motivation*

What are you doing and why? Why is your work significant, both within your field, and to society at large? What is challenging about your proposed work? Include in this section your focused research question.

### *(d) Previous Work*

Identify and critically comment on selected relevant previous work. How is your project different and better than this previous work? Do not simply list previous work.

### *(e) Specific Aims*

Concretely list the specific problems (about three) you propose to solve. It is a useful strategy to match your specific aims with corresponding concrete motivational issues identified in the motivation section.

### *(f) Plan*

How will you accomplish your specific aims?

### *(g) Deliverables*

What is the output of your project? *E.g.*, project report, PowerPoint slides, presentation, source code.

*(h) Issues*

What difficulties do you foresee, and how do you plan to overcome them?

*(i) Bibliography*

List (in proper bibliographic form) all works you need to complete your project.

*(j) Biographical sketches of the investigator(s)*

*(k) Schedule*

List a timeline of major steps toward completing your project.

*(l) Budget*

What resources (including your own time) do you need to complete the project? Be sure to include your wages, equipment, travel (e.g., to present your work at a research conference). Using a spreadsheet (e.g., Excel), summarize in one simple page your direct, indirect, and total costs. Your costs should not be zero. As your indirect costs, include a 52.5% overhead for UMBC on all direct costs. (*Indirect cost* is UMBC's overhead. *Direct costs* are everything else, including UMBC's 33% of any salary for benefits.)

*(m) Appendix A: Research conference and papers*

What research conference most closely matches your work? Attach (but do not staple) a copy of the "introductory paper" and "reference paper" for your project. The "introductory paper" (possibly a survey) provides a useful introduction to your problem. The "reference paper" that serves as a launching pad for the project. Typically, the reference paper would be a specialized research paper that closely matches what the group is trying to do. The group might build from, extend, modify, or improve (however modestly) this reference paper.

### **Evaluation of Proposal**

Each group will evaluate one other group's proposal. The format of the evaluation should be an NSF-style review of about 1–3 pages. The evaluation must comment on each of the following elements:

- (a) Intrinsic scientific merit of proposed research in terms of likely significance, novelty, and nontriviality.
- (b) Likely broader impact of project on society.
- (c) Qualifications of investigator to carry out the proposed research successfully.
- (d) Reasonableness of the proposed budget (does the budget accurately reflect the necessary costs to complete the work?).
- (e) Appropriateness and completeness of proposal to this assignment.
- (f) Detailed technical comments on proposed problem, awareness of previous work, and plan of attack.
- (g) Overall evaluation, recommendation, and suggestions.

### **Progress Report**

The progress report should be organized in two parts: a draft report and additional notes. It should *not* look like the proposal.

The draft report should include a complete outline and all required parts and sections of the final report (even if some are currently empty), including updated references.

The additional notes should explain what you have accomplished and what remains to be done. Discuss any difficulties and how you plan to overcome them. Any significant changes from the proposal should be noted. Include a revised schedule.

### **Referee Report**

Each group will evaluate one other group's draft report and draft presentation (e.g. set of PowerPoint slides) in time to make changes for the final report. Each review must include the following elements:

- (a) A referee's report (about 1 page) commenting on the report's appropriateness, scientific merit, effective communication, and overall evaluation and recommendation. The format and style of the

referee's report should be exactly like those for refereed computer science journals (e.g. organize the referee report in five sections: summary of results, appropriateness of project to assignment, scientific merit, effective communication, and overall evaluation).

(b) Annotated copy of draft report. Many detailed comments are most efficiently communicated via an annotated copy.

(c) Annotated copy of draft presentation.

### Final Report

Be sure that your document is complete, as described in my essay, "Some advice on writing a technical report," [http://www.cs.umbc.edu/~sherman/Courses/documents/TR\\_how\\_to.html](http://www.cs.umbc.edu/~sherman/Courses/documents/TR_how_to.html)

The organization of the report should be some variation of the standard outline for all scientific work: abstract, keywords, introduction, background, previous work, methods, results, discussion, open problems, conclusions, acknowledgments, references. Include printouts of any source code as a separate appendix. The report should look like computer science research paper (e.g., you are welcome to follow the IEEE style templates). Number each page. You may optionally include a response to any referee reports.

Please hand in these items on 8 ½ x 11 inch white paper, one-sided, with one staple per item in the upper-left corner. Put one large binder clip around package. Write your name(s) on each item. Do not use folders or covers. Keep a copy of everything you hand in for your records, in case something gets lost. Each group must also submit electronically via BlackBoard, as to be explain (using a system that will check for plagiarism).

Common errors from previous years include: (a) failure to explain precisely what problem was solved and why, (b) failure to identify clearly what is new, significant, and nontrivial about the work, (c) previous work is simply listed but not commented upon critically, (d) axes of graphs are do not clearly identify type, units, and scale, (e) observed standard deviations are not listed when reporting average values from experimental work, (f) document is missing one or more required parts, such as abstract and keywords, and (g) abstract is not informative.

Write an "**informative**" abstract, not a "descriptive" abstract. The abstract should explicitly state what you accomplished and should serve as a substitute for the entire paper; it should not be confused with the introduction which motivates the paper. Get to the point in the first sentence. Summarize; do not introduce.

Separate background and previous work. Background is what is needed to understand your report. It is not new research. Previous (and related) work is related worked done previously (or concurrently) by others (or possibly you) that is similar to what you are trying to do. When discussing previous work, explain how your work is different and better.

Every graph needs a number, name, and caption. Be sure also to label each axis with type (e.g., time), units (e.g., secs), and scale (e.g.,  $10^3$ ). Briefly explain any notable features of these graphs. When comparing two algorithms, include the time for each algorithm on the same graph. Similarly, for a space comparison, include the space for each algorithm on the same graph (not on two separate graphs).

Prepare your report using document preparation system of your choice so that you are able to edit your drafts easily. Latex is the only available system for which it is possible to produce beautiful mathematical prose (MikTex is a free version)—see Wiki. I strongly recommend using Latex.

Your report should look like a computer science research paper (for example, see any IEEE Transactions). Do not include a separate title page. You are welcome to use the style files from the IEEE transactions or from a similar journal series.

Write in the active (not passive voice). Omit needless words. Organize your writing into paragraphs, each with one main idea summarized in a topic sentence (typically the first sentence).

Your audience is an A student in the class. Clarity is the most important principle of writing, including technical writing.

## **Oral Presentation**

Present a research talk similar in style to those given at research conferences (the time limit will be specified later). For group work, each group member should speak for some of the time. PowerPoint presentations are strongly encouraged. Most importantly, communicate what you did, why you did it, what you found, and what is new and significant about your findings. Include enough detail (*e.g.* via an example or special case) to communicate the core technical difficulties and how you solved them.

Each slide should answer a question.

Minimize words. Do not write in complete sentences. Use short bulleted summaries. Use lots of figures, graphs, photographs, color. The most common error speakers make is to include too many words on their slides.

Find ways to engage your audience. Begin with a dramatic demonstration or example.

State your new and significant result up front, before getting into any details. The talk should not be a murder-mystery.