Computational Mechanics and Optimization Laboratory
Research Dissemination

The two most primary tasks of a researcher are to: (1) do meaningful and impactful research and (2) tell the world about it. As such, it is extremely important to learn to effectively communicate our research and every group member is expected to develop these skills. While I will work with you on developing your technical communication skills, you are also expected to develop these skills on your own, e.g., take technical writing classes, and attend workshops on giving effective talks and creating posters. It is also critical that we establish groundrules for authorship and collaboration when it comes to written and oral work to ensure the CaMOLab lab environment remains open, functional, and safe.

Papers

In our field, publications in top journals are the most important and prestigious means of disseminating our research. The top journals in our field (non-exhaustive list) are: Nature, Science, Journal of Computational Physics (JCP), Computer Methods in Applied Mechanics and Engineering (CMAME), Computers and Fluids (CAF), various SIAM journals, International Journal for Numerical Methods in Engineering (IJNME), International Journal for Numerical Methods in Fluids (IJNMF), and several others.

All of our publications will be typeset with LaTeX (see CaMOLab resources on Bitbucket for templates and macros) and, prior to submission, all authors (including me) must complete a *Statement of Authorship* that details their contribution to the project and manuscript. These will be shared and deliberated among the co-authors on the manuscript, which will allow us to ensure the author list and order is appropriate. In my group, we use [2] to define contributions that merit authorship and corresponding authorship. Individuals that contributed to the work through, e.g., discussions, proofreading/editing, minor code contributions, but do not meet the requirements for authorship will be acknowledged for their contributions. Reference [2] defines an author and corresponding author as follows.

> *Each author is expected to have made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data; or the creation of new software used in the work; or have drafted the work or substantively revised it AND to have approved the submitted version (and any substantially modified version that involves the author's contribution to the study); AND to have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.*
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> *The corresponding author will be responsible for the following with respect to data, code, and materials: ensuring that data, materials, and code comply with transparency and reproducibility standards of the field and journal; ensuring that original data/materials/code upon which the submission is based are preserved following best practices in the field so that they are retrievable for reanalysis; confirming that data/materials/code presentation accurately reflects the original; foreseeing and minimizing obstacles to the sharing of data/materials/code described in the work; and ensuring that all authors have certified the author list and author contributions*

With the authors and corresponding author established, the author order is based on their contributions. The first author position is reserved for the person, usually student or postdoc, that drives the work, works through the details of the method and its implementation, and writes a majority of the manuscript. The last author position is reserved for the person who supplied the main idea for the work, oversaw its direction and progress, and assisted the other authors with technical details and implementation when necessary. The remaining author positions are ordered according to the significance of each individual's contribution.

Finally, writing is an inherently iterative and frustrating process. To ease the burden of writing and minimize the amount of unnecessary work, e.g., from meticulously writing sentences that later get removed, I suggest on the following structured approach to collaborative writing. First, all authors will agree on the *scope* of the paper and create a skeleton that consists of section and subsection titles and nothing else. It is very important to get this right early in the writing process to avoid major re-factoring of the paper later on. Therefore, we will spend ample time considering all reasonable alternatives/options until all authors agree on the skeleton. At this point, we also assign an author to each section and subsection. Note that

these assignments will be based on the person most suited to write a particular section and may be a very uneven distribution with the lead author assigned a majority of the sections. Each author will then create a *detailed* bullet list of the content to be included in each section and add the main equations in your own notation (since everyone will be working independently, there will be inconsistencies in the notation, which will be resolved later). *Do not waste time by focusing on sentence structure at this point since we are still establishing the content of the paper. To avoid this tendency, I suggest using short, incomplete sentences for the sole purpose of communicating content.* We will use Bitbucket/GIT to coordinate all of our writing efforts. At this point, all the authors will meet again to decide on the content of each section and the mathematical notation. It is important to prepare for this meeting by reviewing the entire document. Each author will modify their sections to conform to the agreed upon notation and content and begin converting the list of ideas into complete, well-formed sentences. Once all sections are complete, the main writer will go through the entire document to ensure the writing style is consistent. I will make a final pass at the paper prior to submission. Since I will be very involved in the entire writing process of every paper produced in the CaMOLab, from the creation of the skeleton through the submission and reviews of the manuscript, I will assist in the faciliation and coordination of this collaborative writing effort.

Talks

Research talks, if properly designed and executed, are among the most effective means of communicating your research. However, the art of effective technical communication and public speaking are very difficult to master (I am still very, very far from mastering it, but have made significant progress over the years). I encourage you to think critically about and study effective communication of your research using a myriad of resources. I find the online resources and YouTube videos of Jean-luc Doumont to be particularly helpful. One piece of advice Doumont gives is to *design your talk before you start thinking about slides*. This took me forever to learn and has caused me to waste countless hours creating slides that never get used because they do not further my main message. It also helps to avoid creating slides that look like a paper broken up into frames.

Keep in mind that when you give a talk, you represent not only yourself, but the entire CaMOLab, department, and university, and are expected to be a good, professional ambassador. In addition to strategizing the design of your talk and slides, you must complete several *timed practices* of your talk aloud. I am not a believer in "rehearsing" your talk, i.e., writing and memorizing a script for your entire talk, because it requires too much effort and preparation time, interruptions will throw you off, and you will waste too much mental effort trying to remember your "lines" during your talk. Instead, memorize what you want to say on each slide, i.e., the content, rather than how to say it. The slides themselves will serve as helpful cues.

Finally, slide design is a very important consideration and can be extremely time-consuming for researchers of all levels of experience. Young researchers are particularly tempted to create slides with extremely heavy technical content (complicated equations and dense lines of text) and include significant "noise", e.g., various logos, authors/title on every page, outlines, and page numbers, that distract your audience from the important technical content. To help avoid these pitfalls, I *strongly encourage* all CaMOLab members to design talks in LaTeX using the templates I provide (CaMOLab resources on Bitbucket). This will give a sense of uniformity to all CaMOLab talks and the templates are minimalistic to reduce "noise".

Posters

Posters are another effective means of technical communication, but are often taken for granted. Usually at conferences it is possible (and encouraged) to give both a talk and a poster. While this requires substantial preparation, it increases exposure and I encourage you to do so when you have very solid results that should be advertised. While I do not explicitly require it, I encourage you to use LaTeX. I have templates and examples available in the CaMOLab resources on Bitbucket. I also encourage you to carefully review previous CaMOLab posters (see Bitbucket repository) and posters you have found particularly effective and impressive to find inspiration for the design of your poster. You should also seek advice from online resources. Jean-luc Doumont has a book [1] and a wealth of online resources that will be helpful in planning and creating your poster.

Conferences/congresses

Conference attendance is a necessary part of research and highly encouraged among all CaMOLab members to disseminate your research and build a professional network. Between my grants and department funds, there will be funds to attend conferences each year, although which conferences CaMOLab members attend will be determined by a number of factors (see travel section for specific details). If you find conferences you think may be relevant, notify me immediately and we will decide together if it is worthwhile. When deciding and preparing for conferences, always be aware of the important deadlines: organization of minisymposium, abstract submission, early registration, etc.

In addition to dissemination of your research, it is extremely important to build your professional network at conferences. However, this is usually the most difficult and awkward aspect of conferences, particularly for introverted people, because it involves striking up a conversation with people you have never met. I have found the most "natural" way to meet new people at conferences is to attend the talk of a speaker whom you'd like to meet and approach them immediately after, or during a coffee break, with detailed questions. Researchers love to talk about their work and this will usually lead to a discussion about your work.

Finally, there are a few pieces of conference etiquette/advice to keep in mind: (1) be professional (well-dressed; no shorts, t-shirts, inappropriate writing or designs, or revealing clothes), (2) attend *all* talks in a session in which you speak (unless you have a good excuse, it is rude to only show up for your talk), and (3) try to step out of your comfort zone and meet new people, whether they are students or more senior researchers.

Travel

Between lab research grants and the AME department, there will be funds to attend relevant conferences and congresses each year. The lab members that attend specific conferences will be determined by the project status, the relevance of the conference, availability of funds, and seniority in lab. New lab members will be able to travel to conferences as attendees, depending on the available funds. Many conferences offer student and early career travel awards. All eligible lab members should apply for these opportunities since they are good for your CV (I have received several during my time as a graduate student and postdoc) and will help extend lab travel funds. Finally, for lab members working on projects that involve collaboration with other institutions, we will likely travel to these sites at least once per year to coordinate the project and work with our collaborators in person.

References

[1] Jean-Luc Doumont. *Trees, Maps, and Theorems: Effective Communication for Rational Minds*. Principiae, 2009.

[2] Marcia K McNutt, Monica Bradford, Jeffrey M Drazen, Brooks Hanson, Bob Howard, Kathleen Hall Jamieson, Véronique Kiermer, Emilie Marcus, Barbara Kline Pope, Randy Schekman, et al. Transparency in authors' contributions and responsibilities to promote integrity in scientific publication. *Proceedings of the National Academy of Sciences*, 115(11):2557–2560, 2018.