

Call for papers: Conference on computational methods in science and engineering

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Task

Prepare a conference paper (4–6 pages including figures, typed, double-spaced, stapled, using the provided template) and a 5-minute presentation on a computational problem in science, engineering, mathematics or computer science.

Topic

You are free to choose **any** topic to study so be sure to choose a problem that you find intriguing. The only requirement is that the problem be resolved using a computational approach and touch on some aspect of a science-related field. With your subject in mind, the first step is to formulate your project as the response to a question. Examples of well-formulated and answerable research questions are:

- What is the best angle at which to strike a golf ball for maximum range?
- What is the travel time between any two points on the surface of the Earth if the trajectory is a straight-line path passing through the Earth and the only force involved is that of gravity?
- What is the margin for error in firing angle (in degrees) when trying to strike the target in the Winter Olympics biathlon?
- What is the effect of mass on the trajectory and range of a ski jumper?

What makes these ‘good’ questions? First, they are clear and well defined. Second, their answers are not obvious. Third, you have the know-how to tackle them. Fourth, and perhaps most importantly, they are interesting. Examples of poorly formulated or ill-defined research questions are:

- What is the best angle at which to strike a golf ball?
- What does the fluid flow around a car look like?
- What is the orbit of the earth around the sun, neglecting the effect of the moon and other planets?
- What is the effect of air resistance on a bowling ball falling from a tall building?

This topic was investigated by students last year. Check out their excellent blog posted on the course WordPress site.

This question is vague as ‘best’ is undefined.

A good question, but too difficult!

Does not require a computational approach.

Too easy.

Context, audience and genre

The context for the final paper and presentation will be that of an undergraduate, multi-disciplinary academic conference. As such, you are writing for an audience with a very technical background (*i.e.* your peers) but not necessarily with any specific knowledge of the topic you will discuss. Seen in this light, your paper should be both *informative* (in that you will present new information to the reader) and *analytical* (in that it will have a significant technical content).

Conference papers are a genre unto themselves. They are generally much shorter than a full research article and less formal. Nonetheless, it is important that you provide *context* for your question (*i.e.* why it's interesting), the relevant *theory*, a description of any *models* (why they are needed, when they are valid, and their expected accuracy), the computational approach, a validation of your model, and analysis of results. Remember, your audience will be skeptical; you must present not only an answer to your question, but also a convincing *argument* as to the validity of your answer.

Writing and feedback

A fundamental part of academic discourse is the peer-review process which involves critique and rebuttal. For example, if a researcher wishes to present their work at a conference, they are generally required to submit a draft of their manuscript for peer review. Reviewers provide a critique of the paper to which the researcher must respond before the work can be accepted.

We will provide feedback to one another using a similar, but considerably more relaxed, process streamlined through the use of a blog. The class will be divided into workgroups consisting of four teams. A blog site will be created for each workgroup with a link posted on the main course blog. The topic of each blog post and its due date are given below:

Note: While you will only be required to give feedback to teams within your workgroup, you are still encouraged to consult and participate in the other workgroups.

Blog post 1: Introduction to topic of choice, statement of research question, summary of literature search.

Due date: March 26th

Critique and response 1: Individual critique on the proposed research questions of (at least) two other groups (using Reply button). Team response to all criticisms directed at your project.

Due date: April 2nd

Blog post 2: Revised research question. Summary of research methods: overview of relevant theory, description of models and numerical techniques.

Due date: April 9th

Critique and response 2: Individual critique on the proposed methods of (at least) two other groups (using Reply button). Team response to all criticisms directed at your project.

Due date: April 16th

Blog post 3: Revised research methods. Presentation of test cases, possibly with preliminary results of code testing and/or calibration.

Due date: April 23rd

Note: Although blog posts and responses to critiques are completed as a team, the critiques are to be completed **individually**.

Evaluation

The grade distribution and methods of evaluation are as follows:

Element	Weight	Method of evaluation
Blog activity	5%	Self-evaluation checklist
Final code (Due: May 14th)	5%	Rubric attached
Final presentation (Due: May 16th)	4%	50% peer, 50% teachers
Final report (Due: May 16th)	6%	Rubric attached
Total	20%	

In addition, a *best paper award* will be discerned by a jury of faculty members and submitted for possible publication in Dr. Jes.