

Research Tools and Methods for the Mathematical Science

Lecture 8: Templates for some tasks

Matthew Roughan

`<matthew.roughan@adelaide.edu.au>`

[http://www.maths.adelaide.edu.au/matthew.roughan/
Lecture_notes/ResearchToolsCourse/](http://www.maths.adelaide.edu.au/matthew.roughan/Lecture_notes/ResearchToolsCourse/)

School of Mathematical Sciences,
University of Adelaide

April 1, 2015

Proof by example: “It works for X and Y, so it must be true.”

Good writing ... is clear thinking made visible
*Ambrose Bierce, Write it right: a little blacklist
of literary faults*

Common tasks

- Write a paper or technical report
 - ▶ including a literature review
- Give a talk
- Write a review/critique
- Write a project proposal

What will I do here

- There's already lots of advice about all of these tasks
- I will provide
 - ▶ motivation – why you should do these things
 - ▶ pointers to useful information
 - ▶ a rough template to get you started
- Not just about templates – about what you can learn from them.

Writing a paper

Basics

- Read the submission guidelines
 - ▶ determine scope of paper (length, detail, ...)
 - ▶ look at recent papers in the journal
 - ▶ follow the submission guidelines
- Process
 - <http://cseweb.ucsd.edu/~swanson/WritingPapers.html>
 - ▶ submission, rebuttal, and revision
 - ▶ expect to work hard leading up to a deadline
- Write with impact

A rough template of a paper or technical report

- Title and abstract (summary)
- Introduction: MUST BE STRONG!!! [KLR89, Rot97]
 - ▶ introduce basics
 - ▶ motivation
 - ▶ describe what you are doing
 - ▶ summary of results
- Background
 - ▶ literature review (or related work) but I don't call it this
 - ▶ common notation and definitions
 - ▶ references for techniques to be used
- Approach – what we did
 - ▶ your approach in DETAIL
- Results
 - ▶ how you tested your idea in DETAIL
 - ▶ conclusions drawn from result
- Conclusion

Structure

Notes

- Each section has to encourage reading of the next
- Avoid “outlines” or bland reviews
 - ▶ always make a point
- You don't have to write it in order
 - ▶ often write intro last
 - ★ and abstract after that
- Some people put lots of weight in conclusions, but I don't believe people read them
 - ▶ I treat the conclusion as punctuation
 - ▶ don't waste much time on it
 - ▶ repeat main results – no new information
 - ★ don't put conclusions in the conclusion
 - ▶ maybe indicate future work

Impact [Don02]

- In academia “impact” = citations (roughly)
 - ▶ but its really about influencing people
 - ▶ same idea applies outside academia
- Secrets
 - ▶ do good work
 - ▶ write accessibly – bring people in
 - ▶ work with good (highly cited) people
 - ▶ be useful to people
 - ★ provide code and data (for free)
 - ★ work on topics that people are interested in
 - ▶ don't solve everything at once
 - ★ leave room for improvement
 - ▶ hammer the same topic into the ground
 - ★ I don't do this, but [Rot97]

And if you don't believe me go to

http://scholar.google.com.au/citations?user=Mnkm_NsAAAAJ&hl=en

More on the literature review

Why do we cite?

- To provide attribution of ideas
 - ▶ avoid plagiarism
- To support our arguments
 - ▶ every statement you make should be supported by logic, data or citations
- To provide a link
 - ▶ e.g., standard technique, definition, data or software
 - ▶ so someone else can find a resource
 - ▶ further reading
 - ▶ so we don't have to explain every single thing in our paper
 - ▶ so our paper can be more readable
- To show you understand the context of your work
 - ▶ you know your work is novel, and why
 - ▶ if you are repeating/validating work then you know it

Citations get used as a measure of impact: e.g. h-index, so people really care

The role of references

<http://www.rogerclarke.com/SOS/SCSP-09.html>

BibTeX

BiBTeX and BiBLaTeX [http:](http://www.eng.cam.ac.uk/help/tpl/textprocessing/biblatex.html)

[//www.eng.cam.ac.uk/help/tpl/textprocessing/biblatex.html](http://www.eng.cam.ac.uk/help/tpl/textprocessing/biblatex.html)

Macs and bibdesk

Writing a talk

Present to inform, not to impress;
if you inform, you will impress.

Fred Brooks

There is vast amounts of online help for giving talks

- for simple hints [[Rot97](#), [Azu03](#)]
- more details <http://www.cs.utexas.edu/users/dahlin/professional/goodTalk.pdf>
- some for specific venues, but much of the advice is general
<http://www.siggraph.org/publications/instructions/>
- how to give a bad talk
<http://pages.cs.wisc.edu/~markhill/conference-talk.html>
<http://www.cs.utexas.edu/users/dahlin/professional/badTalk.pdf>

Key points and common flaws

- Don't run overtime [Rot97]
- Know your audience (and cater for them)[Rot97]
- Script your first slide
- Your listeners will most likely take away only one point [Rot97]
 - ▶ give them something to take away (or they will make it up)
 - ▶ repeat with thematic variations
- 3 x 1/3 rule
 - ▶ first 1/3rd of talk should be for ALL of the audience [Azu03]
 - ▶ second 1/3rd for a large subsection
 - ▶ last 1/3rd for just the particular people in your area

and at each stage, tell them what you are going to do, and make them care enough about it to listen.

- Use big fonts [Azu03]
 - ▶ in plots as well as text
- Practice (PPPPPP)

Death by powerpoint

the dangers of advice

Rules may obviate faults, but can never confer beauties.

Samuel Johnson

<http://norvig.com/Gettysburg/>

These are some notes on the Gettysburg meeting. I'll whip them into better shape when I can get on to my computer.

Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation or any nation so conceived and so dedicated can long endure...

*Transcribed from voice recording by A. Lincoln,
11/18/63*

Advice I ignore

- Don't put too much on the slide
 - ▶ I use slides as props to help me remember what I wanted to say
- Don't use “comic sans” (the font)
 - ▶ I like it
 - ▶ its friendly, and unintimidating
- Don't use WYSIWYG tools
 - ▶ for a quick presentation, sometimes I do
 - ▶ it makes it easier for people to grab and hack
- PPPPPP (Proper Preparation Prevents Piss Poor Performance)
 - ▶ sometimes I just don't have time to prepare slides as well as I would like
- Don't X
 - ▶ I have ignored almost any rule you can mention at some point, but I **choose** to do it for reasons, after thinking about it.

Writing a (peer) review

Why?

- Opportunity to learn how to write your papers better
- Basic task for academics (of your papers are being reviewed, you need to contribute back and do it yourself).
- If bad reviews make you mad, you should help fix it by doing good reviews.

When?

- You'll be asked, probably as soon as you start publishing.
- Maybe your supervisor will ask you to do one, supervised by him/her.
- Say yes.

What?

- Conference or journal papers (to decide if they are accepted)
- Grant applications (to decide if they are granted)
- Public review (to provide potential readers with information)

Writing a review

The task of the referee is to evaluate in a **timely** manner a paper for publication in a specific journal or conference proceedings. This involves determining if the work presented is **correct**, if the problem studied and the results obtained are new and **significant**, if the quality of the presentation is satisfactory or can be made so, and what revisions and changes to the paper are necessary and/or desirable. The evaluation must be with regard to the coverage and degree of **selectivity** of the specific publication.

Alan Jay Smith [Smi90]

Significant?

- Its all opinion – there is no correct answer
 - ▶ Small surprising vs important but repetitive?
 - ▶ Negative results?
- Does it fit the venue
 - ▶ quality varies by venue
 - ▶ venues have styles as well as topics of interest

Writing a review

How? (see for instance [All08])

- Read critically
 - ▶ look for flaws in execution, or logic
 - ▶ look for plausibility
 - ▶ look for interest
 - ▶ does it take account of previous work?
- Write constructively
 - ▶ your review is probably anonymous
 - ★ and private to editor, reviewers and authors
 - ★ but write it as if you might have to defend it publicly
 - ★ still need to write without fear or favour
 - ▶ be polite and helpful
 - ▶ be concrete
 - ★ don't say "its wrong" – explain why
 - ★ don't say "this work has been done before" without a citation
 - ★ don't say "some claims are questionable." Any claim can be questioned, even if the answer is always "Its correct!"
 - ★ if it isn't interesting (to you), try to say why

Writing a review

How?

- Be ethical
 - ▶ keep confidences
 - ▶ do your due diligence
 - ▶ avoid conflicts of interest
- Try to see the big picture, not just minutiae
 - ▶ do problems detract from the main value of the paper?
 - ▶ are the problems small enough to fix with a bit of rewriting?
- Be efficient
 - ▶ you may end up doing a lot of these (I probably do 40-50 a year)

What not to do: http://www.research.att.com/people/Cormode_Graham/library/publications/Cormode09.pdf

Writing a review a rough template

Read the guidelines for your particular case, but here's a rough guide:

Title:

Authors:

Submission number:

Summary: (one or two paragraphs)

Key Strengths: (a few bullet points)

Key Weaknesses: (a few bullet points)

Detailed comments for the authors: (as long as needed)

Comments for the editor: (often empty)

Recommendation:

Reject

Major Changes or Resubmit

Accept (maybe with Minor Changes)

- The recommendation should be in accord with the comments.
 - ▶ Comments are provided regardless of recommendation
- Comments for the editor should be used only for procedural issues, not to allow you to take a private swipe at the paper

What you learn

Reviewers read quickly

- Reviewing isn't fun
- We are all too busy
- We do lots of reviews (I probably do 40-50 a year)
- The result is they read your work quickly or very quickly
 - ▶ they will miss things
 - ▶ they can't/won't check every detail
 - ▶ if your writing is clean, they are more likely to think you are careful and take results on faith

More information [KLR89, pp.31-33]

<http://www.icir.org/mallman/plea.txt>

What you learn

Reviewers can be put off easily

- Sometimes it seems they are deliberately negative
 - ▶ the “adversarial” reviewer is looking for reasons to reject the paper
http://www.research.att.com/people/Cormode_Graham/library/publications/Cormode09.pdf
<http://www.abc.net.au/radionational/programs/ockhamsrazor/the-difficulties-of-getting-a-research-paper/3457692>
- Don't be put off
- Think about why they are irritated – is your paper irritating to read?
 - ▶ a little humility, and a little work on writing can make a paper much more pleasant to read
 - ▶ sloppiness is irritating – I spend hours trying to make my papers clean so reading someone else's mess is irritating
 - ▶ don't waste the readers' time
 - ▶ follow instructions
 - ▶ make sure relevant citations are included – nothing is more irritating than an author who forgets your work

A Project Proposal

A rough template

- Title: descriptive but short
- Investigators:
- Aim (goal):
 - ▶ one sentence (maybe two)
 - ▶ avoid weasel words
- Deliverable(s)
 - ▶ short list (1-3 items)
 - ▶ what the client wants, not what you want
 - ▶ achievable (you may be held to these)
- Time-line
 - ▶ brief: start, finish, major items
- Budget
 - ▶ brief, line items
- Description
 - ▶ intro
 - ▶ approach/methods
 - ▶ references

A Project Proposal Notes

- The trick is to write about work to be done as if it is both already done, and yet not done.
 - ▶ it must seem achievable (with zero risk)
 - ▶ but not trivial
 - ▶ these two are contradictory for research
- Mix of
 - ▶ long-term, hard, “stretch” goals
 - ▶ short-term, achievable, milestones
- Do it in one page (or maybe 2)
 - ▶ at least to start with
 - ▶ more generally, follow any guidelines given

A Project Proposal Evaluation

Similar evaluation criteria to other reviews, but there are more criteria to consider

- Is the topic significant?
- Does the investigator have experience to do the work?
- Is the method reasonable?
- Is the budget reasonable (and within funding bounds)?
- Are the necessary facilities available?
- Is the project good value for money?
 - ▶ deliverables vs cost

Publish or perish

- You need to write papers
 - ▶ you can argue about the system <http://www.guardian.co.uk/science/2011/sep/05/publish-perish-peer-review-science>
 - ▶ in the short term publications are the measure used to judge academics
- The best place to publish varies
 - ▶ traditional journals
 - ▶ open access journals: ARC has an open access policy http://www.arc.gov.au/applicants/open_access.htm
 - ▶ conferences (with refereed proceedings)
- In the long run, your body of work and its impact will count
 - ▶ in the short term, no-one can evaluate that
 - ▶ so they look at the stack of papers
- Balance is good
 - ▶ conferences and journals
 - ▶ single authors and multiple
 - ▶ not just with your supervisors

Other approaches

- blogs
- arXiv <http://arxiv.org/help/primer>
- websites like
 - ▶ <http://www.mathoverflow.net>
 - ▶ <http://math.stackexchange.com>
- matlab central, CRAN, CPAN, ...

Is posting on the internet good or bad?

- patents

Summary

- Basics of four common tasks
 - ▶ bias towards research, but most apply to some degree in any technical field
-

Assignment

Write a 3 minute thesis talk for week 12

<http://www.adelaide.edu.au/3mt/>

Further reading I



Mark Allman, *Thoughts on reviewing*, ACM Computer Communication Review **38** (2008), no. 2, Editorial Contribution.



Ronald T. Azuma, "*So long, and thanks for the Ph.D.!*" a.k.a. "*Everything I wanted to know about C.S. graduate school at the beginning but didn't learn until later.*", 2003, <http://www.cs.unc.edu/~azuma/hitch4.html>.



David Donoho, *How to be a highly cited author in the mathematical sciences*, in-cites (2002), <http://www.in-cites.com/scientists/DrDavidDonoho.html>.



Donald E. Knuth, Tracy L. Larrabee, and Paul M. Roberts, *Mathematical writing*, Mathematical Association of America, 1989, jmlr.csail.mit.edu/reviewing-papers/knuth_mathematical_writing.pdf, contains a huge amount of very good advice, but loosely organised (just reports of a set of lectures).



None, *Blank*.

Further reading II



Gian-Carlo Rota, *Ten lessons I wish I had been taught*, Notices of the AMS **44** (1997), no. 1, 22–25, <http://alumni.media.mit.edu/~cahn/life/gian-carlo-rota-10-lessons.html>.



Alan Jay Smith, *The task of the referee*, Computer **23** (1990), no. 4, 65–71, <http://www.eecs.berkeley.edu/Pubs/TechRpts/1989/6154.html>.