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tips for writing a proposal



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A bit of background: Jim

- ❖ grad school @ Columbia after liberal arts degree in physics, following my girlfriend (now wife) to NYC
- ❖ Columbia -> UMass: knew I wanted to teach, to live “in the country”
- ❖ 4 sabbaticals: IBM, INRIA, U. Paris, UMass
- ❖ research: computer networks. IEEE, ACM Fellow
- ❖ textbook; ACM education; IEEE/CS education medal
- ❖ Dept. chair, dean
- ❖ ~70 grants, awards (various sizes, sources)



A bit of background: Susanne

- ❖ grad school @ Penn State after a Dipl. Ing. In Vienna, Austria (following no one)
- ❖ Penn State -> Purdue; Purdue solved my 2-body situation (was their opportunity)
- ❖ research: algorithms, query processing, computer science education
- ❖ Department Head, Division Director CCF/CISE/NSF
- ❖ CRA, CRA-W, CRA-E
- ❖ Funding sources: NSF, ONR, AFOSR, Darpa, industrial sponsors



1: Pick good problem(s)

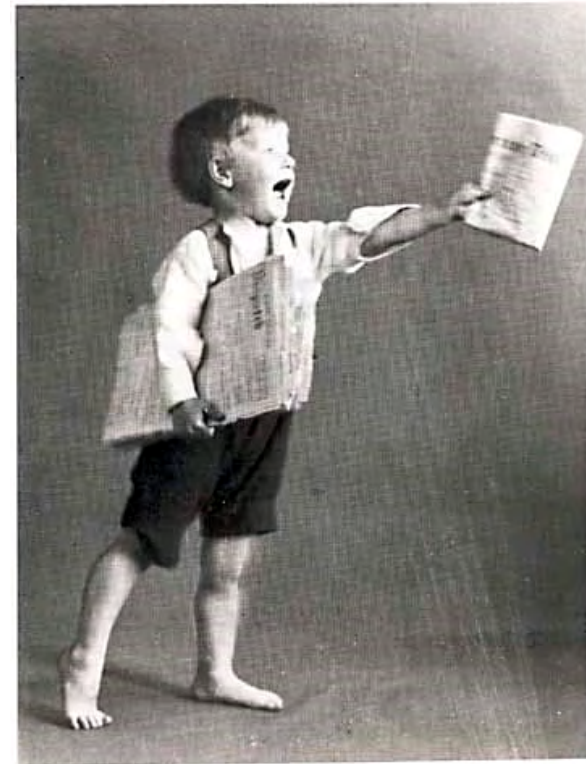
- ❖ why is the problem important?
 - what happens if you do not solve this problem?
 - why should anyone care?
- ❖ new fundamentals/principles involved?
 - universal truths (best) versus point solutions (not as good)
- ❖ a problem area with “legs”?
 - ❖ once you’re done, is story over, or is this fundamental work leading to lots of future work?
 - ❖ are you setting a foundation?



A fool can ask more questions in a minute than a wise man/woman (or a Yoda) can answer in a lifetime

2: Every proposal tells a story

- ❖ what is the “elevator pitch” of your proposal (reviewers, PDs)?
- ❖ story is *not* mechanics of what you will do, but rather
 - what you will show, new ideas, new insights
 - why interesting, important
 - power of “story” may differ between program
- ❖ why is story of interest to others?
 - universal truths, hot topic, surprises or unexpected results
- ❖ know your story!



3: **What** will you do, and **how** will you do it?

- ❖ basic questions all reviewers will ask
- ❖ so **ask and answer these questions** for the reviewers in your proposal



what – questions to be addressed

how – methodology to address questions

4: Specific research questions

- ❖ clear problem statements: pose questions, show initial results, demonstrating methodology
 - questions alone aren't enough (anyone can pose questions – how will you address them?)
- ❖ some near-term problems that you have an idea how to attack
- ❖ list longer term problems that you may only have vague idea of how to solve
 - showing longer term issues is important

5: Initial work: must be done before proposal

- ❖ initial results demonstrate feasibility
 - illustrative, explanatory to reviewer
 - provide intuition about what you will do
- ❖ but if the problems are basically solved already, then it's not proposed research
- ❖ illustrate approach(es) to solving problems
 - show you possess right skill set



6 Past work

- ❖ be specific about past related work, how proposed research differs
 - reviewers are knowledgeable, aware of past work [sometimes did the past work you are citing!]
 - what is the value added of proposed work (not just difference)



"What Descartes did was a good step. You have added much If I have seen a little further it is by standing on the shoulders of Giants."

Sir Issac Newton, 1676

7a Introduction: crucial, formulaic

- ❖ *if reviewer is not excited by intro, proposal is lost*
- ❖ recipe:
 - *para. 1:* motivation: broadly, problem area, why important?
 - *para. 2:* narrow down: what is problem you specifically consider
 - *para. 3:* “In this proposal, we”: most crucial paragraph, tell your elevator pitch
 - bulleted list, `\bf` or `\em` initial text of major contributions
 - *para. 4:* how different/better/relates to other work, at high level
 - *para 5:* summarize contributions at higher level, long-term 10K ft view of contribution: change the world!
 - *para. 6:* ... remainder of proposal structured as follows ...

7b Broader impact

- ❖ important review criteria: will be explicitly addressed in proposal evaluation
- ❖ know what a broader impact *is*:
 - read NSF statement: <http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/index.jsp>
 - <http://cisebroaderimpacts.org/> - CISE-specific wisdom/examples of broader impacts
- ❖ critical for large- (and medium-) sized proposals
 - poor broader impacts can sink a proposal
 - smaller proposals: BI impacts tend to be more formulaic
- ❖ leverage institutional resources/programs
 - you don't have to do it alone and it can be an idea/effort proven to work

8. Submit to a program funding the research you propose

- ❖ understand goals of program/solicitation
 - ask people who know, don't assume or guess
 - essential for cross/special programs
 - what/who has been funded recently
 - communicate with program directors
- ❖ if your research fits into more than one core program, communicate with relevant program directors before the submission
 - ❖ proposals don't always get moved or shared



9. Know the review process

- ❖ proposals can get sorted and assigned to panels based on the information in the summary
- ❖ reviewers may read 10-15 proposals (lots of work, tiring)
 - interesting, fun/pleasant to read proposals a rarity
- ❖ reviewers will typically be panelists present at NSF (virtual panels becoming common)
- ❖ rank proposals and bin: highly competitive, competitive, (low competitive), not competitive



10. Put yourself in place of reviewer

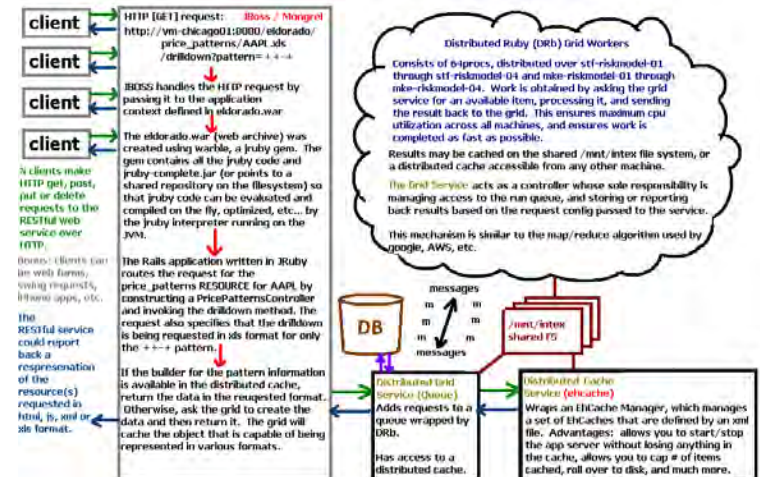
- ❖ less is more:
 - “I would have sent you less if I had had time”
 - *take the time to write less*
- ❖ reviewers shouldn't have to work
 - won't “dig” to get story, understand context, results
 - need textual signposts to know where “story” is going, context to know where they are
 - good: “e.g., Having seen that ... let us next develop a model for Let Z be”
 - bad: “Let Z be”
- ❖ what does reader know/not know, want/not want?
 - write for reader, not for yourself

11. Put yourself in place of reviewer

- ❖ page upon page of dense text:
no fun to read
 - avoid cramped feeling of tiny fonts, small margins
 - create openness with white space: figures, lists
- ❖ provide enough context & information for reviewers to understand what you write
 - no one has as much background/content as you
 - no one can read your mind
 - define all terms/notation



Too much detail!



12. Master the basics of organized writing

- ❖ paragraph = ordered set of topically-related sentences
- ❖ lead sentence
 - sets context for paragraph
 - usually ties to previous paragraph
- ❖ sentences in paragraph should have logical narrative flow, relating to theme/topic
- ❖ don't mix tenses in descriptive text
- ❖ one sentence paragraph: warning!

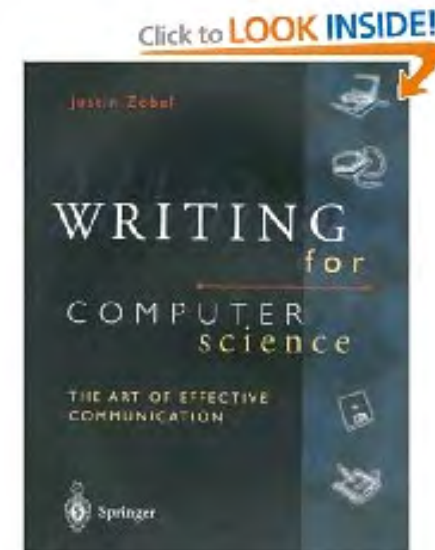


"No tale is so good that it can't be spoiled in the telling"
Proverb

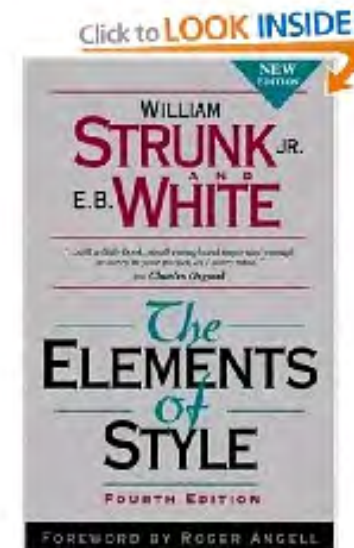
13. Write top down

- ❖ computer scientists (and most human beings) think this way!
- ❖ state broad themes/ideas/questions first, then go into detail
 - context, context, context
- ❖ even when going into detail ... write top down!

The Elements of Style
by William Strunk E. B. White
(50 years old – and still a classic!)



Writing for Computer Science
by Justin Zobel



14. Good proposal writing takes time

- ❖ give yourself time to reflect, write, review, refine
- ❖ give others a chance to read/ review and provide feedback
 - get a reader's point of view
 - find a good writer/editor to critique your writing
 - you may get contradictory advice
- ❖ starting proposal two weeks before deadline, while ideas/ results still being generated: non-starter
- ❖ get a "red team" review a week before it's due



Learn from Declinations

- ❖ it' ll happen now and then, for the rest of your professional life
- ❖ learn from a declination
 - *Why* was paper/proposal rejected?
 - *What* did/didn' t reviewers see/like?
 - talk to the program director
- ❖ but don' t write assuming the same reviewers will review your proposal (paper). They won' t!



Perspective of an NSF DD on junior PIs

- ❖ successful PIs:
 - choose a good problem related to their expertise but not continuing the PhD research
 - get mentoring and help in preparing a proposal
 - are enthusiastic about research
- ❖ junior PIs: likely to get benefit of the doubt in core programs
 - in larger efforts, a junior PI is generally not a good idea
- ❖ if a proposal is declined
 - getting verbal feedback from the program director is crucial: helps understand the reviews
 - don't take a declination personally: many good proposals don't get funded
- ❖ submit a career or a small core proposal?

More words of wisdom... (from earlier discussions)

- ❖ process of writing improves the research!
- ❖ read the solicitation, know the proper home for your proposal
 - know special preparation and evaluation criteria
 - talk to cognizant program manager
- ❖ have a really good (required) one-page summary upfront (intellectual merit, broader impacts)
 - all reviewers will be asked to answer these questions
- ❖ use an example that shows *richness* (but simple enough for reader to understand), *threads through proposal to provide unity/common thread*

More words of wisdom...

- ❖ volunteer to be a proposal reviewer
 - better yet: have someone send your name to the right person
 - you learn by seeing the process
- ❖ teaming up with a more experienced researcher on a first proposal can be good start
- ❖ generating proposals: great idea (great) versus “there’s deadline” (harder)
- ❖ (new words of wisdom go here)

Take home messages:

- ❖ choose your problems and program carefully
- ❖ be bold (and/or portray yourself as bold):
remember the big picture, vision
- ❖ present a clear plan for research, with
preliminary work, mastery of material
- ❖ write *extremely* well: put yourself in place of
reviewer
- ❖ advice/feedback: from mentors, PMs before
submission, from PM if declined