14 13 12 11 10 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!
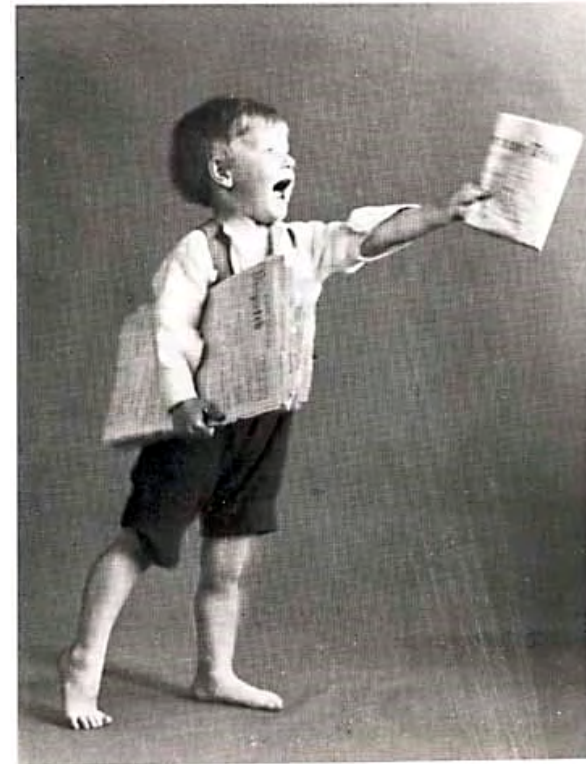
3: *What* will you do, and *how* will you do it?

❖ 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!
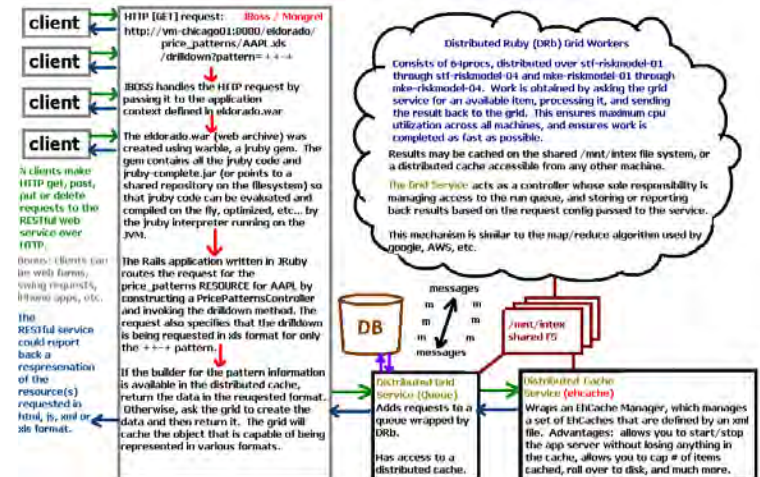
12. Master the basics of organized writing

- ❖ 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
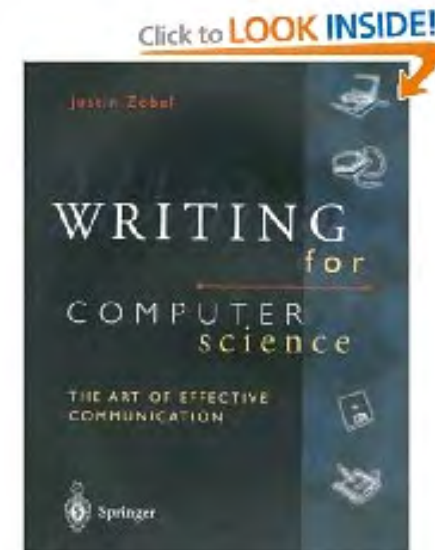- ❖ one sentence paragraph: warning!

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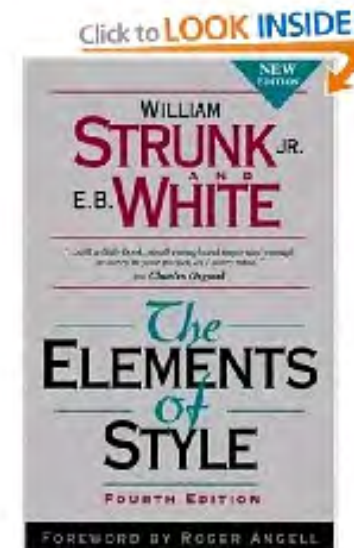*Proverb*

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!

Writing for Computer Science
by Justin Zobel

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

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