Agenda

• Paper writing
• Proposal writing
Research Paper Writing
You Have Finished Your Research, Then What?

• Get your research published
  – The rule in science: publish or perish
  – Publication as a process of evaluating research work and validating research findings

• Where to publish your research?
Journals vs. Conferences

• Issues
  – Review speed
    • Years vs. Months
  – Publication timeline
  – Quality
  – Dissemination

• Culture in Computing-related research

• Culture in academia in general
  – Physics, biology, engineering, social science, etc.
What Do Reviewers Look At?

• Contents
  – Is the research question valid?
  – Does the method sound?
  – Is data analysis correct?
  – Are results logical?

• Originality
  – Is the idea creative?

• Relevance
  – Are the audience interested in the paper?

• Presentation
  – Is the paper easy to ready?

• Significance
  – Is the contribution of the paper significant enough?
Some Questions You Should Address in a Paper

• We have learnt:
  – What is the research problem?
  – Why is it important?
  – What have been done?
  – What is your approach?
  – What have you learned from the study?
  – Who would care about your results?
The Anatomy of a Research Paper

• An often seen structure
  – Introduction
  – Relevant research
  – Your own approach
  – Method
    • Experiment design
    • New algorithm
    • Results
  – Discussion/Conclusion
Writing the Introduction

- A very general overview of what problem this paper tries to address?
- What hypotheses do you have?
- What method do you use?
- How is your research related to previous work?
- What contribution does your research make?
- A brief introduction about the paper structure

A few tips
- Usually no need for subsections
- Page length
  - Conference papers
    - 1 -1½ for a long paper (8-10 pages) (ACM format)
    - ¾ for a short paper (4-6 pages)
  - Journal paper: no specification.
Writing the Literature Review

• We have discussed this.
• Don’t wait until the last minute
• Write down your thoughts about a paper when you read it!
  – Pros and cons
  – What will you do differently?
• A literature review is to compile and integrate those previous reviews you have done
• Length
  – 1-2 pages in a long paper
  – $\frac{1}{2}$ in a short page
Your Own Approach

- Analytical framework, system design ideas, design rationale, algorithm design, etc.

- Length
  - 1-2 pages in a long paper
  - ½ -1 page in a short page
Method Section

• Often the first part people write.
• Sufficient details should be provided
  – Experimental study
    • Subjects, Materials/Instruments, Design, Tasks, Procedures
  – Design study
    • Design alternatives, Design comparison, Design choice, Implementation
  – Algorithm study
    • Algorithm description, complexity analysis
  – Result
    • What data did you get?
      – Which sets of data did you analyze and why?
      – What methods were used to analyze data?
      – How do the results look like?
        » Graph
    • Don’t interpret and discuss results yet.
  – 4-5 pages (long), 1½ - pages (short)
Writing the Discussion

• What do your results mean?
• What conclusions can you draw about your hypotheses based on the given results?
• How do your results related to other relevant or competing theories?
• What are the limitations of your study and results?
• ¾ -1 page (long), ¼ (short, can be combined with conclusion)
Writing the Conclusion

• Summarize what your research is about,
  – What results you have obtained, and how your results support your hypotheses
  – Try to generalize your results
  – Where can your results be applied?
  – Under what conditions?
  – Identify some open issues and point out future research directions

• \( \frac{1}{4} \) page
Planning

• Have a rough design of your paper
  – Figures
  – Tables
  – Formulas
Writing Is Hard!

• Writer’s block
  – Difficult to start
  – Difficult to continue
How to Overcome Writer’s Block?

• Starting from context-independent parts
  – More objective and straightforward

• The context of paper in publication
  – Context-dependent parts
    • Introduction, discussion, conclusion
  – Context-independent parts
    • Method, Results
  – In between
    • Literature review

• Suggested order of writing
  1. Method
  2. Writing an exhaustive literature review first
    • Selecting relevant literature for literature review
    • Shortening it according to where the paper goes
    • Cutting down writing is easier.
  3. Discussion and conclusion
  4. Introduction and abstract.
Knowing Audience and Themes

- Tailor those context-dependent parts
  - Audience
    - Who are they? Practitioners or researchers?
  - What are they more interested in?
    - Theory, action guideline, new insight, ...
  - Methods or new ideas?
    - Empirical or theoretical research
    - Interdisciplinary or traditional
- Read published papers
  - Understand their review criteria and process
- Know your reviewers
  - The review board
  - The conference committee
A Progressive Approach in Writing

• Structure of a paper
  Paper
  Section
  Subsection
  Topic sentence
  More detailed description

• Focus on structure first
  Section
  Subsection
  Topic sentence

• Adding figures, tables, formulas
• Adjusting sections, subsections, topic sentences
  – Logic flow of the paper, logical connections among sections
• Adding detail descriptions
  – Elaboration, transition
Some Tips

• You want a paper to be significant enough, but you don’t want to put too many things there.
• Empirical research papers are easier to be published.
• Always get someone to read your paper before submission.
• Give yourself enough time
• Put aside the paper for a while for the final draft
• Keep all your revisions
  – Backup
• Stop somewhere you can easily pick up the writing.
More Readings on Writing

• Good Writing
  – http://www.alice.org/Randy/raibert.htm
    • “Good Writing is Bad Writing That Was Rewritten”

• Elements of Style

• Writing Your Dissertation in Fifteen Minutes a Day
Research Proposal Writing
Proposal Writing

• A proposal vs. a research paper
  – A research plan vs. a report on a finished project
• They both require well-developed arguments on
  – The importance of research question
  – The establishment of context
  – The methods
  – The potential impact of the research
• ..., but they also differ from each other.
  – A paper reports what you have done.
    • Evaluation is about the validity of the work you have done.
  – A proposal outlines a plan.
    • Evaluation is about the validity of the work as well as whether you can do it.
• Extra work for a proposal
  – Research timeline
  – Budgets
  – Evaluation plan
  – Benefits for funding agencies
  – More importantly, your credential to do the research
Proposals for Foundations

• Foundations
  – Have their particular goals and missions
  – Usually very specific
  – Ford Foundation
    • to "strengthen democratic values, reduce poverty and injustice, promote international cooperation, and advance human achievement."
  – W. K. Kellogg Foundation
    • to "help people help themselves through the practical application of knowledge and resources to improve their quality of life and that of future generations."

• Clearly defined the scope of fundable projects
  – Don’t bother if your projects do not quite fit

• Tend to be very strict on the application procedures
  – Understand how to approach them
Find Appropriate Funding Opportunities

• Search for foundations online: http://fdncenter.org
• Find the directors of programs
• Know the process
• Initial letter of intention, visit, through your employer, …
A Good Proposal to A Foundation

• Proposed activities are within the scope of the foundation
• Actions are valuable: immediate problems, building foundations for future development
• Investigators are experts in the area and know the state-of-art issues
  – Why should you be the person to do it?
• Results are important sufficiently to justify the time and money
• Budget
  – What is allowed?
    • Travel, student support, ...
  – Is cost sharing required?
    • What does your employer provide?
Government Founding Agencies

• **Top Tier**
  – National Science Foundation (NSF)
  – National Institutes of Health (NIH)

• **Second tier:**
  – Office of Navy Research (ONR)
  – Army Research Lab (ARL)
  – Department of Defense (DOD)
  – Department of Energy (DOE)

• More strict reviewing processes
  – Very prestigious and competitive

• Larger grants
  – Multi-million projects
  – Salary of investigators allowed
Understanding the Missions of Each Agency

• NSF grants
  – “... priority areas are focused on frontiers of knowledge, where discovery and innovation are likely to produce significant progress”

• NIH
  – “... pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability.”
Review Processes – NSF

• Peer review
  – Review panels
  – Single-blind reviewing
    • Excused yourself in proposals with conflict of interest.

• Criteria
  – Intellectual merit
  – Rationale, methodology, qualification, feasibility, ...
  – Broader impact
  – Contribution to research, teaching, learning, ...
  – Integration of research and education
  – How would students benefit from the research?
Proposals to Companies

• Some are competitive
  – Google Research, Microsoft Research, …
  – Maybe tougher than NSF proposals.
  – Review processes varies
    • Internal experts or world-wide experts involved.

• Some are non-competitive
  – Companies may come to ask you to write a proposal.
  – Review is more about contract and legal issues.
Writing a Winning Proposal

• Start early
• Planning your proposal months earlier
• Tell a good story in your proposal
  – Nobody likes to read boring proposals
• Being focused
  – Making your proposal fit the target program
• Get other people read it before submission
• Identify potential reviewers
• Use bullets, tables, and graphs where appropriate
• Choose a font that is easy to read
NSF Graduate Research Fellowship Program

• Very prestigious

• Gives you the freedom in doing research
  – No need to be attached to a particular faculty member.
Final Words

• Writing is important to your career development.
  – Communication skills

• Wring as a way of thinking
  – Help to make your argument clear, organized, and logic.
  – Help you speak better

• No shortcut for writing
  – Practice, practice and practice