

# INFO4990 IT Research Methods

## Communicating Research

Lecture by Alan Fekete

## Learn from others

- Whenever you read papers, and attend seminars
  - Notice what helps you as audience/reader
  - Notice what annoys or confuses you
  - Discuss your reactions with colleagues and supervisor
- Make sure you adjust your own writing or talks as a consequence

## Overview

- *Motivations*
  - of the Researchers
  - of the Targets (audience, readers)
- Writing Papers
  - Conference/journal
  - Thesis
  - The Introduction
  - Literature review
- Giving Talks

## “Know thyself”

- To communicate well, you need to understand your own goals in the activity
  - What outcome do you hope for?
- Common reasons for people to want to communicate research
  - Make impact; change the world
  - Build reputation; be known
  - (because it's required, eg thesis)

## Impact

- You really believe your ideas will help the community
  - So you want the people working on related projects to adopt your ideas in their own work
- Target: a small group of specialists
- Goal: convince them that your ideas are worth following
- Key: clarity (explain what is your key contribution, what evidence backs it up)

## Reputation

- You really want people to think highly of you
  - Vital for your career (references for jobs/promotion; invitations to prestigious positions; connections to help your students or junior colleagues)
- Target: a broad group of opinion makers
- Goal: associate you with “clever/important”
- Key: excitement (catchy terms, links to important issues)
  - See R. Snodgrass and M. Brucks, “Branding Yourself”, ACM SIGMOD Record, June 2004

## “Put yourself in their shoes”

- Effective communication needs to meet the needs of the audience/reader
- Why do they spend the time to listen/read?
  - Don't assume they care about you or your goals
  - You must offer them value toward *their* goals
- How do they think about the topic?
  - There is often a “standard worldview” in a community
  - You must relate your work to their interests, approach, emphasis

## Generally interested

- Most of the audience/readers will not be specialists in the topic
  - Eg audience at a departmental seminar
- They want to know what's going on in the field, what are key topics
  - They have not read all the recent work you built on
- They may leave or lose interest if you get too technical

## Specialists

- There will be a few people who work in the field (eg authors of the papers you read!)
  - They are not usually eager to accept your work
    - they often start by assuming that they already did whatever is needed, so you are wrong/misguided/etc; they will be seeking to show your mistakes; they look at your work starting from their own assumptions
- They can fill in lots of obvious steps, but they want to see how you overcome the hard problems

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## Writing a Paper

- Write for a particular community
  - Know which conferences/journals the community uses
  - Know the expectations (eg performance?, proof? etc)
- Don't worry about length/format etc at first
  - It's easy to change format
  - It's possible to cut length as needed
    - Provide the extra material in a technical report
- Process may be top-down, or bottom-up, or (most often) mixed

## Top-Down Writing

- Start with section headings
- Then choose subsection headings
- Then, key idea of each paragraph
  - i.e. paper as list of bullet points
- Finally, fill in fluent text of one paragraph at a time
- Then revise
  - Get feedback from friendly readers

## Bottom-up writing

- Write fluent text fragments
- Then arrange them into a structure of sections etc
- Then do a pass to check it flows easily
- Then revise, based on feedback

## Common Paper structures

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Abstract</li><li>• Introduction</li><li>• Related Work<ul style="list-style-type: none"><li>– May be moved to later</li></ul></li><li>• Claim</li><li>• Evidence<ul style="list-style-type: none"><li>– Maybe called “Evaluation” or “Proof”</li></ul></li><li>• Conclusion and Future Work</li></ul> | <ul style="list-style-type: none"><li>• Abstract</li><li>• Introduction</li><li>• Related Work</li><li>• Research Method</li><li>• Data</li><li>• Analysis</li><li>• Conclusion and Future Work</li></ul> |
|---|---|

Common in Systems and Theory,  
where Research Method is obvious

Common in Information Systems

## Abstract

- One or two paragraphs
- Aim: to help a potential reader decide whether or not they are interested to read the rest of the paper
  - So make clear the key domain of your work
    - Eg automated analysis or manual analysis
    - Eg fault-tolerant or not
  - Also, indicate what you actually achieved
- Understandable by anyone in the field

## Introduction

- General readers will concentrate on this section
  - Make sure you fit your work into the general agenda of the community
  - Discuss implications of your work for the field
- State your contributions explicitly and succinctly
  - Usually at end of the intro, just before (or integrated with) the overview of the paper's structure

## Related Work

- General readers will use this as survey of the important ideas of your field
  - It will help build other people's reputations
    - So be sure to cite the seminal work
  - It must be well organized
- Specialists will check that you have cited them sensibly
  - And use this to help see how your work fits into the field
  - So be sure to explain how you differ from each cited source, esp if you make different assumptions or solve a different problem!

## Core Technical Sections

- General readers will likely skim this
  - Make it easy to start in any subsection
    - Initial sentence re-establishing key idea
  - Make it easy to find things used later
    - Put key definitions, notation, restrictive assumptions in groups, with use of **bold** to draw attention
- Specialist readers will be seeking obvious errors or weakness
  - Make sure you defend, by dealing with issues
    - Eg point out a difficulty you had to overcome
    - Eg acknowledge drawbacks, and explain why this isn't fatal

## Conclusion

- This section is usually short
- Re-state the main contributions, and the sort of evidence you provide
  - Often similar wording to end of introduction!
- It's usual to mention ways in which you would/could extend the work
  - Partially as "turf claim"
  - Partially to increase interest in the work

## Shortening the length

- Conferences usually have very short papers (eg 5 pages in AI, 10 in theory, 12 in databases)
  - You will often need to cut material from the paper to meet this "page limit"
  - Reference a technical report where you publish the full version
- Reduce the technical material, but leave indications of what was difficult
  - Eg replace proof by "sketch of proof", or leave out design detail
- If needed, cut words, cut sentences, join paragraphs
  - especially where paragraph has just a few words on the last line
  - play with white space

## Common mistakes

- Historical focus ("Diary" style)
  - Paper follows wrong turns, shifting ideas
  - Paper concentrates on an implemented or designed system, rather than on the ideas that are the contribution in the design, or the understanding that resulted
- Hidden assumptions
  - Paper doesn't clearly indicate restrictions on applicability (eg "this requires a workload with mostly read-only ops", "our design doesn't deal with faults like message loss")
  - Paper doesn't state which performance aspect you are trying to do well on (eg "we aim to reduce peak congestion")

## Tools

- Microsoft Word is very common
- Especially in theory community, LaTeX is often used (for excellent equation support)
  - There are environments that give WYSIWYG
- Standard styles for each conference series, journal etc
- Tools to manage bibliography (eg BibTeX, EndNote, Refer)
  - Keep a single repository with info about all documents you might cite

## Thesis

- Thesis structure is similar to a paper
- But with much more detail, and a different goal
  - To impress a few markers!
    - For PhD, MSc the markers are experts
    - For Hons/MIT, the markers are not experts
  - So show your breadth of knowledge, your insights, your care in evaluation

## The Introduction

- The Introduction to a thesis should tell the reader what was accomplished and why one cares about this
  - Suitable for generalist
  - Many staff or potential employers will read this, and nothing else, to judge author's skills in both research and exposition
- It provides the "big picture" that puts the later details in context
- Typical length 5p to 15p

## Road-map to the Introduction

- The following rhetorical structure is very common, though often implicit (work of Swales)
- I: Establish the field
- II: Summarise previous research
- III: Prepare for current research
- IV: Introduce present research

Adapted from talk by Prof Janet Wiles (UQld)

## I. Establish the field

- Describe the whole subfield and its main purpose(s)
  - Try to show importance for industry, society etc
  - Eg “the field of multimodal interfaces aims to make computers that can be used by people in the styles they already use for inter-human communication, like speech or gesture, because these should be easier to learn than a restricted command language that must be typed”
- This discussion can be repeated at several levels of specialization
  - Eg “HCI; interface design; multimodal interfaces; gesture-based interfaces”

## II. Summarise previous research

- What are the core ideas that have been accepted in this subfield
- Cite seminal papers, but don’t discuss each in detail
- This should leave a positive feeling: “look how much we know/understand”

## III. Prepare for your research

- Identify at least one gap: what is not known yet
  - Eg “so far, all the methods decide to cache or not one relation at a time; systems have not tried to cache some rows only from a relation”
  - The gap may be an interaction “we can optimize register usage, and we can optimize power, but it is not yet known how to reduce both at once”
- Show implications of solving the gap
- Discuss possible methods to solve the gap

## IV. Introduce your research

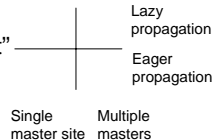
- Clearly state what contribution(s) you have made
  - Or “will make” if you are writing a proposal
- Clearly state what evidence you offer for the contribution
  - Relate the evidence to a standard research method (unless that is obvious)

## Literature Review

- In a thesis, the literature review is used to show that the author knows *and understands* the connections between their work and the field
- Typical length 10-20p
- Often could stand alone as a survey of the field
  - See articles in ACM Computing Surveys for inspiration

## Styles of literature review

- Present some taxonomy of the field, and then discuss each aspect
  - Eg “A security system needs to (i) somehow identify the principals, (ii) classify the operations, and (iii) decide who can do what”
- Identify several axes of variation, and place works along these
  - Eg classic “Gartner quadrant”



## Discussion of each previous work

- Do explain the key contribution of the work (at the time it was done)
  - Don't just repeat the words of the paper
  - Show context (eg “this was done to remove XXX feature of [cite]”; “this was extension of the authors earlier work [cite]”)
- Do show how terminology of paper corresponds to later/standard/your terminology
- Do discuss strengths of the paper that are out of scope of your research
  - Don't just criticize paper for not solving what you are interested in
- *Be respectful but not fawning*

## Conclusion of literature review

- Identify the community
  - Their main publication forums
- Identify main relevant goal(s) of the community
- Identify what the most significant ideas have been
- Show achievements and gaps
  - Your thesis will presumably address one gap

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## Types of Talks

- Conference talk
  - Usually 15-25 mins
  - Audience is in the broad field (often authors of other papers at same conference!)
  - Mainly to persuade audience to read the paper in proceedings!
- Seminar talk
  - Usually 50-75 mins
  - Audience is very diverse (eg students and academics from a whole department)
  - Mainly to build your reputation, and to increase interest in your field

## Structure

- Introduce yourself (brief!)
- Introduction (about 40% of the time)
- Key ideas (about 20% of the time)
  - You don't have to cover the details (they are in the paper)
  - Focus on something hard or clever, and show why it is hard/clever
- Further work
- Conclusion: repeat the contribution
  - What the audience will remember from your talk!
- Questions
  - at least 5 mins; at a conference the session chair will set your time limit to allow this!

## Tools

- Microsoft Powerpoint is almost universal for producing presentations
  - There are alternatives such as Latex Beamer class
  - A laser pointer can sometimes be helpful, or use the computer's mouse cursor to focus attention on key part of diagram
- Have a backup printed set of OHPs
  - In case hardware/software is incompatible, or simply broken at the time
- If your voice isn't strong enough for the venue, use microphone

## Mistakes in preparation

- Too much detail
  - Not enough introduction for general audience
- Not enough structure
  - Audience gets lost and finds it hard to rejoin the argument
  - Repeated outline overhead can help
- Too much animation in overheads
  - Or too many fonts/colours/artwork
  - The audience should be able to get the key ideas just from the overheads

## More mistakes

- Poor or missing concrete examples
  - General ideas need to be shown in specific situations
    - Eg trace one execution of your algorithm or system design
    - Eg show screen shots of an innovative UI, or sample programs in your new programming language
- The examples need to be simple, and illustrate the important point
  - Keep them consistent: it's very hard to find an example which can illustrate several different aspects, but the benefit to listeners is great
- Don't try to invent examples "on-the-fly"

## Mistakes in Delivery

- Reading the overheads
  - Instead of talking around/about them
- Not enough eye contact and vocal variety
- Bad timing
  - Audience suffers if you have to rush through the last part of the talk
    - Or if you don't get to it at all
  - Less damage from a talk that's too short
- Bad pacing
  - Speaker moves ahead into details/solutions while a previous overhead is still showing, so when the next overhead is shown, it has already been discussed!

## Rehearsal

- Get the length *and* pacing right
  - It's hard to judge until you actually speak it
    - One overhead might take 1 minute, or 5 minutes
    - The same overhead can be stretched or shrunk
- Make yourself comfortable with the structure, and content
  - Know what is ahead
  - Also, get fluent (don't stumble over words)

## Job talk

- In academic hiring, it is normal to have the shortlisted candidates give a seminar
  - In US, also spend a few days, meeting everyone in the dept
- Similar to normal research seminar, but
  - More on the future research agenda
  - Often cover many pieces of previous work, and try to make them look coherent while showing diversity of speaker's skills!
  - Speaker is showing how clever they are
  - Speaker is showing how clearly they can explain a field

## Key lessons of this lecture

- Keep in mind the goals and assumptions of your targets
  - Make the presentation useful to them, and to your own goals
- Revise, revise, revise!
  - Give practice talks, have friends/supervisors read draft versions of papers
  - When someone misunderstands something, you must revise to prevent the same mistake by others (misunderstanding is the fault of the author, not the reader!)