How to Write a Good Paper and How to Give a Good Talk

(some of the material also applies to “how to teach a class”)

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Why I am giving this talk...

- not because I am a good writer (in fact I’m not)...

- but because I was a terrible writer!

- paper writing
- presentation
- teaching
- proposal writing
How I learned writing

• ’03: knew nothing about writing (though I wrote several papers in China)
• ’04-5: all I wrote was crap; David turned them into beauty
• ’06-7: some progress by writing, writing, and writing...
  • one of the reviews for a submission with David (rejected)
    • “in general this paper is written with admirable clarity, except for it doesn’t seem to be written by a single author or with the same level of discretion...” (this made me not sad about the rejection... :P)
    • turns out David had revised all but one section
• ’08 and on: all my submissions got 4 or 5 in “clarity”
How I learned writing

• **fallacy:** students learn to write mainly from advisors

• **truth:** learn from anybody whom you can learn from

• I learned writing mainly from...

• and from writing seminars of...

• and from the slides by...

the rest of the talk is largely based on Simon PJ’s slides.

L. Saul  
B. Pierce  
S. Peyton-Jones  
D. Chiang  
K. Knight  
D. Gildea
First Principle: Audience-Centric

• always have your audience (the reader) in mind!
• writing is communication, NOT self-expression!
• reader-centric attitude, not self-centric
Writing papers: model 1

Idea → Do research → Write paper
Writing papers: model 2

- Forces us to be clear, focused
- Crystallises what we don’t understand
- Opens the way to dialogue with others: reality check, critique, and collaboration
Do not be intimidated

Fallacy  You need to have a fantastic idea before you can write a paper. (Everyone else seems to.)

Write a paper, and give a talk, about

any idea, no matter how weedy and insignificant it may seem to you
Do not be intimidated

Write a paper, and give a talk, about any idea, no matter how insignificant it may seem to you

- Writing the paper is how you develop the idea in the first place
- It usually turns out to be more interesting and challenging than it seemed at first

LH: talk, write as early as you can; don’t wait until you feel ready; it doesn’t mean you have to publish it.
The purpose of your paper
Papers communicate ideas

- Your goal: to infect the mind of your reader with your idea, like a virus
- Papers are far more durable than programs (think Mozart)

The greatest ideas are (literally) worthless if you keep them to yourself
The purpose of your paper is not...

To describe the WizWoz system

- Your reader does not have a WizWoz
- She is primarily interested in re-usable brain-stuff, not executable artefacts
Your narrative flow

- Here is a problem
- It's an interesting problem
- It's an unsolved problem
- Here is my idea
- My idea works (details, data)
- Here's how my idea compares to other people's approaches
Structure (conference paper)

- Title (1000 readers)
- Abstract (4 sentences, 100 readers)
- Introduction (1 page, 100 readers)
- The problem (1 page, 10 readers)
- My idea (2 pages, 10 readers)
- The details (5 pages, 3 readers)
- Related work (1-2 pages, 10 readers)
- Conclusions and further work (0.5 pages)
The abstract

- I usually write the abstract last
- Used by program committee members to decide which papers to read
- Four sentences [Kent Beck]
  1. State the problem
  2. Say why it’s an interesting problem
  3. Say what your solution achieves
  4. Say what follows from your solution
Example

1. Many papers are badly written and hard to understand

2. This is a pity, because their good ideas may go unappreciated

3. Following simple guidelines can dramatically improve the quality of your papers

4. Your work will be used more, and the feedback you get from others will in turn improve your research
- Abstract (4 sentences)
- **Introduction** (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
- Conclusions and further work (0.5 pages)
The introduction (1 page)

1. Describe the problem
2. State your contributions

...and that is all

ONE PAGE!

LH: this is the hardest part of writing!

need to convey:
importance and hardness

abstract:
1. State the problem
2. Say why it’s an interesting problem
3. Say what your solution achieves
4. Say what follows from your solution
LH Method for Stating the Problem

- intro = “your slightly biased view of the history” [N. Dinesh]
- need to convey: importance and depth

- this is an important problem
- the dominant solution is good in A
- but bad in B (and B is important)
- the alternative solution is good in B
- but bad in A

Q: how to combine their merits?? a hard problem!

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>s1</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>s2</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>new</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Abstract

Conventional $n$-best reranking techniques often suffer from the limited scope of the $n$-best list, which rules out many potentially good alternatives. We instead propose forest reranking, a method that reranks a packed forest of exponentially many parses. Since exact inference is intractable with non-local features, we present an approximate algorithm inspired by forest rescoring that makes discriminative training practical over the whole Treebank. Our final result, an F-score of 91.7, outperforms both 50-best and 100-best reranking baselines, and is better than any previously reported systems trained on the Treebank.

1 Introduction

Discriminative reranking has become a popular technique for many NLP problems, in particular, parsing (Collins, 2000) and machine translation.
State your contributions

- Write the list of contributions first
- The list of contributions drives the entire paper: the paper substantiates the claims you have made
- Reader thinks “gosh, if they can really deliver this, that’s be exciting; I’d better read on”
State your contributions

Do not leave the reader to guess what your contributions are!

Which of the two is best in practice? The trouble is that the evaluation model has a pervasive effect on the implementation, so it is too much work to implement both and pick the best. Historically, compilers for strict languages (using call-by-value) have tended to use eval/apply, while those for lazy languages (using call-by-need) have often used push/enter, but this is 90% historical accident — either approach will work in both settings. In practice, implementors choose one of the two approaches based on a qualitative assessment of the trade-offs. In this paper we put the choice on a firmer basis:

- We explain precisely what the two models are, in a common notational framework (Section 4). Surprisingly, this has not been done before.

- The choice of evaluation model affects many other design choices in subtle but pervasive ways. We identify and discuss these effects in Sections 5 and 6, and contrast them in Section 7. There are lots of nitty-gritty details here, for which we make no apology — they were far from obvious to us, and articulating these details is one of our main contributions.

In terms of its impact on compiler and run-time system complexity, eval/apply seems decisively superior, principally because push/enter requires a stack like no other: stack-walking
### Contributions should be refutable

<table>
<thead>
<tr>
<th>NO!</th>
<th>YES!</th>
</tr>
</thead>
<tbody>
<tr>
<td>We describe the WizWoz system. It is really cool.</td>
<td>We give the syntax and semantics of a language that supports concurrent processes (Section 3). Its innovative features are...</td>
</tr>
<tr>
<td>We study its properties</td>
<td>We prove that the type system is sound, and that type checking is decidable (Section 4)</td>
</tr>
<tr>
<td>We have used WizWoz in practice</td>
<td>We have built a GUI toolkit in WizWoz, and used it to implement a text editor (Section 5). The result is half the length of the Java version.</td>
</tr>
</tbody>
</table>
No “rest of this paper is...”

- Not: “The rest of this paper is structured as follows. Section 2 introduces the problem. Section 3 ... Finally, Section 8 concludes”.

- Instead, use forward references from the narrative in the introduction. The introduction (including the contributions) should survey the whole paper, and therefore forward reference every important part.
Structure

- Abstract (4 sentences)
- Introduction (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
We adopt the notion of transaction from Brown [1], as modified for distributed systems by White [2], using the four-phase interpolation algorithm of Green [3]. Our work differs from White in our advanced revocation protocol, which deals with the case of priority inversion as described by Yellow [4].
No related work yet

- **Problem 1**: the reader knows nothing about the problem yet; so your (carefully trimmed) description of various technical tradeoffs is absolutely incomprehensible.

- **Problem 2**: describing alternative approaches gets between the reader and your idea.
LH: Two Types of Previous Work

- essential background
- the previous work that your work builds upon
- or improve upon (“shoulders of giants”)
- => intro (w/o which readers can’t understand your work)
- related work: other previous work that is just related to yours
- having them doesn’t change the understanding your work
- simple criteria: can readers understand my work w/o A?

<table>
<thead>
<tr>
<th>your work (2)</th>
<th>related work (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>essential background (1)</td>
</tr>
</tbody>
</table>
The process of writing
The process

- Start early. Very early.
  - Hastily-written papers get rejected.
  - Papers are like wine: they need time to mature

- Collaborate

- Use CVS to support collaboration
Getting help

Get your paper read by as many friendly guinea pigs as possible

- Experts are good
- Non-experts are also very good
- Each reader can only read your paper for the first time once! So use them carefully
- Explain carefully what you want (“I got lost here” is much more important than “Jarva is mis-spelt”.)
Listening to your reviewers

Treat every review like gold dust
Be (truly) grateful for criticism as well as praise

This is really, really, really hard

But it’s really, really, really, really, really, really, really, really important
Listening to your reviewers

- Read every criticism as a positive suggestion for something you could explain more clearly.
- DO NOT respond “you stupid person, I meant X”. Fix the paper so that X is apparent even to the stupidest reader.
- Thank them warmly. They have given up their time for you.
Language and style
Visual structure

![Figure 3. A heap object](image)

The three cases above do not exhaust the possible forms of $f$. It might also be a $THUNK$, but we have already dealt with that case (rule $THUNK$). It might be a $CON$, in which case there cannot be any pending arguments on the stack, and rules UPDATE or RET apply.

4.3 The eval/apply model

The last block of Figure 2 shows how the eval/apply model deals with function application. The first three rules all deal with the case of a $FUN$ applied to some arguments:

- If there are exactly the right number of arguments, we behave exactly like rule $KNOWNCALL$, by tail-calling the function.
- Rule $EXACT$ is still necessary — and indeed has a direct counterpart in the implementation — because the function might not be statically known.
- If there are too many arguments, rule $CALLK$ pushes a call continuation on the stack, which contains the error

remaining of the object is called the $payload$, and may consist of a mixture of pointers and non-pointers. For example, the object $CON(C, a_1 \ldots a_n)$ would be represented by an object whose info pointer represented the constructor $C$ and whose payload is the arguments $a_1 \ldots a_n$.

The info table contains:

- Executable code for the object. For example, a $FUN$ object has code for the function body.
- An object-type field, which distinguishes the various kinds of objects ($FUN, PAP, CON$ etc.) from each other.
- Layout information for garbage collection purposes, which describes the size and layout of the payload. By “layout” we mean which fields contain pointers and which contain non-pointers, information that is essential for accurate garbage collection.
- Type-specific information, which varies depending on the object type. For example, a $FUN$ object contains its arity; a $CON$ object contains its constructor tag, a small integer that distinguishes the different constructors of a data type, and so on.

In the case of a $PAP$, the size of the object is not fixed by its info table; instead, its size is stored in the object itself. The layout of its fields (e.g. which are pointers) is described by the (initial segment of) an argument-descriptor field in the info table of the $FUN$ object which is always the first field of a $PAP$. The other kinds of heap object all have a size that is statically fixed by their info table.

A very common operation is to jump to the entry code for the object, so GHC uses a slightly-optimised version of the representation in Figure 3. GHC places the info table at the addresses immediately
Use the active voice

The passive voice is “respectable” but it DEADENS your paper. Avoid it at all costs.

<table>
<thead>
<tr>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>It can be seen that...</td>
<td>We can see that...</td>
</tr>
<tr>
<td>34 tests were run</td>
<td>We ran 34 tests</td>
</tr>
<tr>
<td>These properties were thought desirable</td>
<td>We wanted to retain these properties</td>
</tr>
<tr>
<td>It might be thought that this would be a type error</td>
<td>You might think this would be a type error</td>
</tr>
</tbody>
</table>

“You” = the reader

“We” = you and the reader

“We” = the authors
<table>
<thead>
<tr>
<th><strong>NO</strong></th>
<th><strong>YES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The object under study was displaced horizontally</td>
<td>The ball moved sideways</td>
</tr>
<tr>
<td>On an annual basis</td>
<td>Yearly</td>
</tr>
<tr>
<td>Endeavour to ascertain</td>
<td>Find out</td>
</tr>
<tr>
<td>It could be considered that the speed of storage reclamation left something to be desired</td>
<td>The garbage collector was really slow</td>
</tr>
</tbody>
</table>
Resources for the Writing Part

• writing resources: http://www.cis.upenn.edu/~lhuang3/writing/

• high-level (language-independent)
  • Simon Peyton-Jones: *How to Write a Research Paper*
  • Mark-Jan Nederhof: *Common Pitfalls in Academic Writing*

• low-level (language-specific -- use NLP!)
  • Gopen & Swan: *The Science of Scientific Writing*
  • Williams: *STYLE: Clarity and Grace* series
  • Strunk and White: *The Elements of Style*
  • Cook: *Line by Line*
How to give a good research talk

Simon Peyton Jones
Microsoft Research, Cambridge

1993 paper joint with
John Hughes (Chalmers),
John Launchbury (Oregon Graduate Institute)
How to give a good research talk

Simon Peyton Jones
Microsoft Research, Cambridge

1993 paper joint with
John Hughes (Chalmers),
John Launchbury (Oregon Graduate Institute)
Do it! Do it! Do it!

Good papers and talks are a fundamental part of research excellence

- Invest time
- Learn skills
- Practice

Write a paper, and give a talk, about any idea, no matter how weedy and insignificant it may seem to you
Giving a good talk

This presentation is about how to give a good research talk

- What your talk is for
- What to put in it (and what not to)
- How to present it
What your talk is for

Your paper = The beef

Your talk = The beef advertisement

Do not confuse the two
The purpose of your talk...

..is not:

- To impress your audience with your brainpower
- To tell them all you know about your topic
- To present all the technical details
The purpose of your talk...

..but is:

- To give your audience an intuitive feel for your idea
- To make them foam at the mouth with eagerness to read your paper
- To engage, excite, provoke them
Your ideal audience...

- Have read all your earlier papers
- Thoroughly understand all the relevant theory of cartesian closed endomorphic bifunctors
- Are all eager to hear about the latest developments in your work
- Are fresh, alert, and ready for action
Your actual audience...

The audience you get

- Have never heard of you
- Have heard of bifunctors, but wish they hadn't
- Have just had lunch and are ready for a doze

Your mission is to

WAKE THEM UP

And make them glad they did
What to put in
What to put in

1. Motivation (20%)
2. Your key idea (80%)
3. There is no 3
Motivation

You have 2 minutes to engage your audience before they start to doze

- Why should I tune into this talk?
- What is the problem?
- Why is it an interesting problem?

Example: Java class files are large (brief figures), and get sent over the network. Can we use language-aware compression to shrink them?

Example: synchronisation errors in concurrent programs are a nightmare to find. I’m going to show you a type system that finds many such errors at compile time.
Your key idea

If the audience remembers only one thing from your talk, what should it be?

- You must identify a key idea. “What I did this summer” is No Good.
- Be specific. Don’t leave your audience to figure it out for themselves.
- Be absolutely specific. Say “If you remember nothing else, remember this.”
- Organise your talk around this specific goal. Ruthlessly prune material that is irrelevant to this goal.
Narrow, deep beats wide, shallow

Avoid shallow overviews at all costs
Cut to the chase: the technical “meat”
Your main weapon 1

Examples are your main weapon

- To motivate the work
- To convey the basic intuition
- To illustrate The Idea in action
- To show extreme cases
- To highlight shortcomings

When time is short, omit the general case, not the example
LH: Your main weapon #2

Visualization!
a picture is worth a thousand words!

greedy search
beam search
Example: Dynamic Programming

- each state => three new states (shift, l-reduce, r-reduce)
- key idea of DP: **share** common subproblems
  - merge equivalent states => polynomial space

(Huang and Sagae, 2010)
Example: Dynamic Programming

- each state => three new states (shift, l-reduce, r-reduce)
- key idea of DP: share common subproblems
  - merge equivalent states => polynomial space

(Huang and Sagae, 2010)
What to leave out
Outline of my talk

- Background
- The FLUGOL system
- Shortcomings of FLUGOL
- Overview of synthetic epimorphisms
- $\pi$-reducible decidability of the pseudo-curried fragment under the Snezkovwski invariant in FLUGOL
- Benchmark results
- Related work
- Conclusions and further work
“Outline of my talk”: conveys near zero information at the start of your talk

- But you can put up an outline for orientation after your motivation
- ...and signposts at pause points
[PMW83] The seminal paper
[SPZ88] First use of epimorphisms
[PN93] Application of epimorphisms to wibblification
[BXX98] Lacks full abstraction
[XXB99] Only runs on Sparc, no integration with GUI
Do not present related work

But

- You absolutely must know the related work; respond readily to questions
- Acknowledge co-authors (title slide), and precursors (as you go along)
- Do not disparage the opposition
  - X’s very interesting work does Y; I have extended it to do Z
Figure 1. Typing Rules
Omit technical details

- Even though every line is drenched in your blood and sweat, dense clouds of notation will send your audience to sleep.

- Present specific aspects only; refer to the paper for the details.

- By all means have backup slides to use in response to questions.
Presenting your talk
Polish your slides the night before

(...or at least, polish it then)

Your talk absolutely must be fresh in your mind

- Ideas will occur to you during the conference, as you obsess on your talk during other people’s presentations
- Do not use typeset slides, unless you have a laptop too
- Handwritten slides are fine
  - Use permanent ink
  - Get an eraser: toothpaste does not work
How to present your talk

By far the most important thing is to be enthusiastic.
Enthusiasm

- If you do not seem excited by your idea, why should the audience be?
- It wakes 'em up
- Enthusiasm makes people dramatically more receptive
- It gets you loosened up, breathing, moving around
LH: Be Fun -- Three Jokes Rule

- Include as many relevant jokes as possible
- three jokes rule
  - one at the beginning (motivation)
  - one at the middle (to wake up people)
  - and one at the end
- especially important in job talks!
Relevant Jokes: Translation Errors

liang’s rule: if you see “X carefully” in China, just don’t do it.
Relevant Jokes: Translation Errors

一旦失窃要报警，切莫姑息又养奸
If you are stolen, call the police at once.

Urban Mass Transportation Branch Shanghai Public Security Bureau
 Relevant Jokes: Translation Errors

clear evidence that MT is used in real life.
LH: Use a wireless presenter

- wireless click + laser pointer + [USB disk]
- smoothes your transition!
Finishing

Absolutely without fail, finish on time

- Audiences get restive and essentially stop listening when your time is up. Continuing is very counter productive

- Simply truncate and conclude

- Do not say “would you like me to go on?” (it’s hard to say “no thanks”)
There is hope

The general standard is so low that you don’t have to be outstanding to stand out.

You will attend 50x as many talks as you give. Watch other people’s talks intelligently, and pick up ideas for what to do and what to avoid.
Conclusion: Technical Communication

- Interaction: almost zero
- Technical details: almost zero
- Interaction: a little or a lot
- Technical details: needed
- Interaction: a whole lot
- Technical details: not needed

- Difficulty: hardest
- Difficulty: easiest