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Writing is not an Art

Université d'Ottawa | University of Ottawa



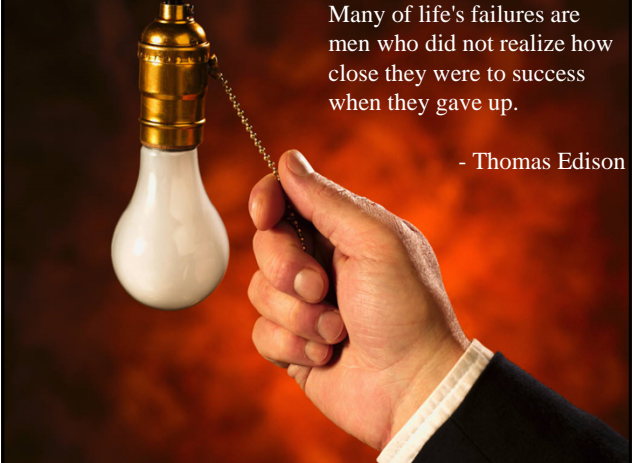
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Many of life's failures are
 men who did not realize how
 close they were to success
 when they gave up.


- Thomas Edison

Only my Opinion

- Everyone is different
 - This presentation provide a course of action → I found useful
 - Many alternative approaches may be appropriate and fits you better
- Use **my** advise at **your own risk**
- Use common sense
- Learn from experience
- I do not necessarily follow the advise all the time



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Ph.D.

- A PhD degree means different things to different people
 - A terminal degree
 - A license to teach
 - A license to do research
 - A Validation of intellectual ability
 - A research apprenticeship



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What do you learn during the Ph.D.

- How to think
- A lot of technical knowledge about some field
- How to do research
 - Formulate and solve problems
 - Write and present results
- How to critique other's work
- How to handle stress management

→ How to teach yourself



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What does it take?

- Intelligence
- Ability to communicate
- Determination (stubbornness?)
- Creativity
- Hard work
- Time management
- Ability to handle stress
- Luck

→→ This is the most competitive thing
most of you will ever do !



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Why pursue a Ph.D?

Higher Salary	Sorry, but ...	
To Teach	Okay ...	To acquire knowledge!
To do research	Okay ...	
For Mom	Won't work	Because you love to learn!
To prove yourself	Not worth it ...	
To be a manager	Not worth it ...	
To avoid the real word	Won't work	



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One of the Most Important Aspects
to be Successful in Your Research,
And Your Career is

Excellent Oral and Written Communication



Structure

- A good article has a definite structure, makes its point, and does not waste space and time
- The most difficult part in writing a scientific paper is planning its structure
- Ideas come while writing
 - Don't wait for the muses
- A craft, not an art: practice
- Read good writers



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Be Aware that

- You should see your paper as the reviewer will see it
 - Reviewers will not see it as the best thing ever discovered even though you might!
- Even papers from best engineers and scientists are rejected and/or they are asked to make major revisions
- You should be proud of your research paper
 - Your publications are your scientific heritage



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What is a paper? (Peyton-Jones)

- Title (1000 readers)
- Abstract (4 sentences, 100 readers)
- Introduction & Motivation (1 page, 100 readers)
- Problem description (1 page, 10 readers)
- Proposed solution = idea (2 pages, 10 readers)
- The details & evaluation and/or performance analyses (5 pages, 3 readers)
- Related work (1-2 pages, 10 readers)
- Conclusions and future work (0.5 pages)



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Before you write → Read Papers

- Find interesting research topics
- So you know what's happening
 - Avoid reinventing the wheel → too many wheels already
- Purpose of reading:
 - To understand and learn new contributions.
- Be aware of:
 - Not all papers are "good"
 - Not all papers are "interesting"
 - Not all papers are "worthwhile" for you
 - You have to learn to identify a good paper and spend your time wisely:
 - Breadth
 - Depth
 - React



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What to read

- Major conferences
 - Journals are a few years behind, but still can be useful
- Tech reports from active research groups
 - need to know which groups to look up
- Survey / overview papers
 - ACM Computing Surveys
 - CACM, IEEE Computer, Spectrum
 - more technical - IEEE Transactions on MM, ACM TOMCCAP, etc.
 - newsletters – ACM SIGMM, ACM SIGCOMM, ACM SIGMOBILE,



How to read a paper → Get an overview of it

- Read the title and the abstract
 - If you don't know what the paper is about → it is a bad paper.
- Read the conclusion
 - If you doubt what the paper is about? → it is a bad paper.
- Credibility
 - Where was the paper published
 - What do you know about the venue
 - Who wrote it and when was it written
- Skim references:
 - Are authors aware of relevant related work.



Why to read?

- To know what's going on (scanning approach)
 - title, authors, abstract
- Papers that are interesting and are in your research area
 - introduction, motivation, solution description, summary, conclusions
 - sometimes reading more details useful, but not always
- Papers you may want to improve on
 - read entire paper carefully



How to read a paper → Now read the content

- If the former interests you → Read
 - the introduction
 - the section headings
 - tables and graphs and captions. See what they say
- Read presented approach and implementation
 - Highlight major points
 - React to the points in the paper
 - If you doubt a statement, note your objection
 - If you find a pleasing quotation, write it down
- Summarize it



What to summarize and note

- Authors and research group
 - Need to know where to look for a paper on particular topic
- Theme of the solution
 - Should be able to go back to the paper if you need more info
- Approach to performance evaluation
 - Need to know what major approaches are used and their advantages
- Any shortcomings
 - Help in explore a research idea and writing a paper



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Caution

- Can suppress innovation
 - once you see solutions using a particular theme, often hard to think differently
- Can give you the impression that the problem is already solved and you need to find another idea!!!

Gain confidence

- Read more and more → Indeed the problem still exist
- Talk to your supervisor → S/He knows more than you think

Experience is a key factor



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Caution

Reading at the early stage of your research might have a site effect

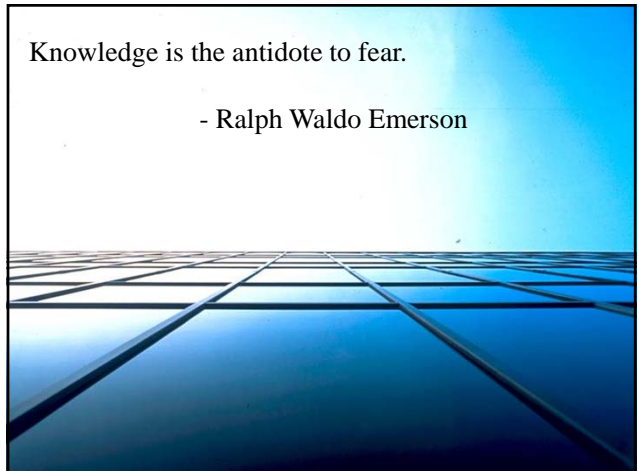


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Knowledge is the antidote to fear.

- Ralph Waldo Emerson



How to write a paper?

1. Do you have an idea
 1. Can you easily explain it to your Mom/Dad and/or any non-technical person?
 2. Is the idea simple? → Go for it
2. Do some reading (related work/ideas), think about its applicability, and speak with as many people as you can in the department
3. Determine the appropriate journal/conference
4. Read and analyse some papers from that venue.
5. **Wowwww** no one else worked on something similar at all? → Go back to 3 (you did not do a proper research of related work yet)
6. Start writing while doing real research
7. Can you make an argument.
8. Are able to write well
9. Do not forget to reference other people → will give your work credibility
10. Give the paper to a friend to read it and come back and read it.

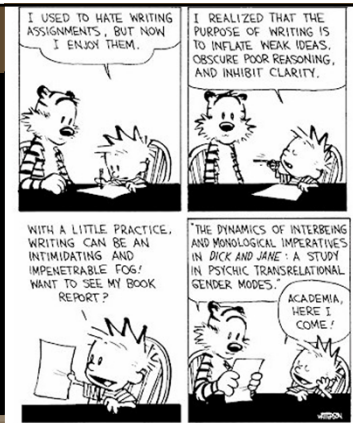


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Myth

- Papers are there to impress others, gain recognition, and get promoted
- No one should understand my paper
- I should bring a lot of buzz words
...bzzzzzzzz



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Constituent of a good paper

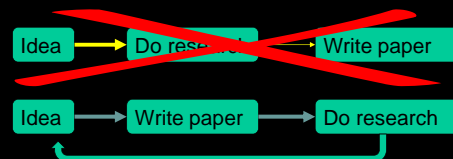
- Novelty → It is your thesis/paper
 - Figure it out for yourself
 - Do not rely on your supervisor
- Good coverage of the literature
 - Read and read and read
- Good data
 - Experiment
- Strong statistical support
 - Evaluate, re-evaluate
- Clarity of presentation
 - If you hate writing – you should get over it
- Thought provoking discussion
 - How can this work be improved and why



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Writing papers: it is all about an idea



- Writing the paper is how we develop the idea in the first place
 - Forces us to be clear, focused
 - Crystallises what we don't understand
 - Opens the way to dialogue with others: reality check, critique, and collaboration



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Start Writing the Day You get the idea

Help to focus the efforts

FACT: the paper defines the scope and the level of needed details

The paper will get written

FACT: much good research NEVER gets written up



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Paper 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



I wish I knew how to solve this problem!

I see how s/he solved it. Nice!

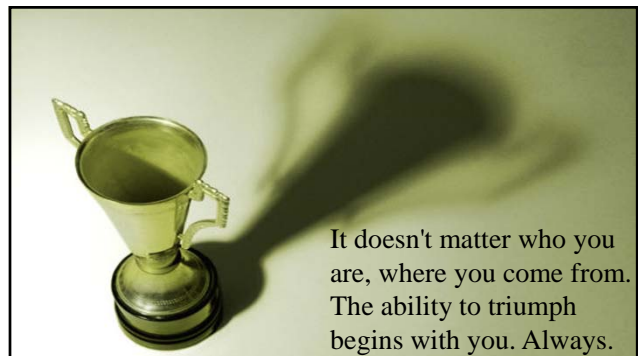


The purpose of a paper is

- To communicate one clear sharp idea:
 - The greatest ideas are worthless if you keep them to yourself
- Make certain that the reader is in no doubt what the idea is.
 - Be explicit:
 - "The main idea of this paper is...."
 - "the main contributions of the paper is"
- Many papers contain good ideas, but do not distil what they are.
- If you have lots of ideas → write lots of papers



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It doesn't matter who you are, where you come from. The ability to triumph begins with you. Always.

- Oprah Winfrey



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Example

1. Biometric Systems identify users based on behavioural or physiological characteristics.
2. Currently, almost all systems involve an identity authentication process before a user can access requested services; such as, online transactions, entrance to a secured vault, logging into a computer system, accessing laptops, secure access to buildings, etc.
3. We investigate the issues related to the usage of Haptics as a mechanism to extract behavioural features that define a biometric identifier system.
4. To test this possibility, we designed, implemented and tested a Haptic system in which position, velocity, force, and torque data from the haptic device is continuously measured and stored as users perform a specific task.



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Very important: The abstract

- I usually write the abstract last
- I usually read it to decide whether the paper is interesting to me or not
- I usually using it as a technical program committee member to decide which papers to review
- 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



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Introduction

- Describe the problem to be solved
 - why it is a problem
 - Why existing solutions are not sufficient
 - sometimes examples help
- Describe the Proposed solution and brief summary of the results
- Describe contributions
 - “The paper makes the following main contributions: + bulleted items” or
 - “The purpose of our analysis is to evaluate the information content of this data. Hence, we assess the uniqueness of each biometric identifier”.
- Easy for reviewers to spot out major contributions
 - Reader thinks “if they can really deliver this, that's be exciting; I'd better read on”



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Introduction

- Don't overclaim
 - But it is good to put your work in a bigger picture and a larger background
- Be careful on wording → let people judge your work (throughout the paper)! → Be careful on wording
 - NO → “Our approach provides a foundation for this new field.”
 - “We believe our approach can provide a foundation...”
 - “We believe our approach has a good potential for providing a foundation ...”



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Contributions should be refutable

Don't

We describe the AdHaptica system. It is really cool.

We study its properties

We have used AdHaptica in practice

Do

We address the state of the art and technology related to our proposed research (section 2) and describe its innovative features (section 3) which are...

We prove that the type system is sound, and that haptic verifications is possible (Section 4)

We have built a system called AdHaptica, and used it to implement a verification system (Section 5). The result are promising and show 21% FAR.



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Be careful

- Another example: be careful on wording
 - NO → “Our approach is the only/first one on”
 - “With the best of our knowledge, our solution is one of the few approaches ...”
- Some reviewers don't like you to claim your own approach to be “novel” (at least don't put “novel” in your paper title!)
 - They said novelty is to be judged by them not to be claimed by you



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Better not to put 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

I feel stupid



I feel tired



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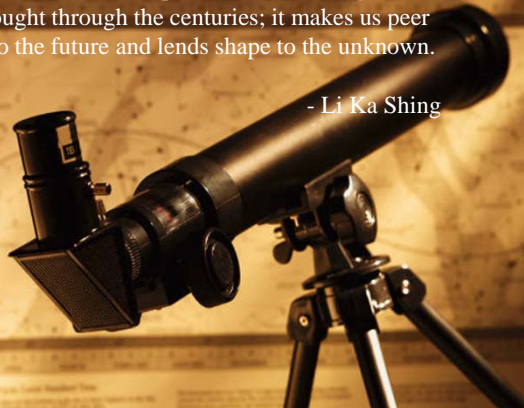


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Vision is perhaps our greatest strength.. it has kept us alive to the power and continuity of thought through the centuries; it makes us peer into the future and lends shape to the unknown.

- Li Ka Shing



Presenting the idea

Consider a bifurcated semi-lattice D , over a hyper-modulated signature S . Suppose p_i is an element of D . Then we know for every such p_i there is an epi-modulus j , such that $p_j < p_i$.

- Sounds impressive...but
- Sends readers to sleep
- In a paper you **MUST** provide the details, but **FIRST** convey the idea



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Presenting the idea

- **Conveying the intuition is primary**, not secondary
 - Once your reader has the intuition, she can follow the details (but not vice versa)
 - Even if she skips the details, she still takes away something valuable
- Putting the reader first
 - **Do not** recapitulate your personal journey of discovery. This route may be soaked with your blood, but that is not interesting to the reader.
 - Instead, choose the most direct route to the idea



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Using examples

- In combination with a visual display, haptics technology can be used to train people for tasks requiring hand-eye coordination, such as surgery and handling hazardous substances. It can also be used for game visual experience to the cutaneous senses. For example, you might play a "haptic paddle pong" game with a computer user somewhere else in the world. Both of you can see the moving ball and, using the haptic display, and swing your pong racket and feel the impact of the ball [23]. By gaining access to the perceptual objects such as shape, weight and object stiffness through the haptic display, the computer-generated environment is extended to simulate real applications.
- Therefore, the application spectrum is quite vast, and its trend of expansion is expected to continue. Applications of this technology have rapidly spread to devices applied to graphical user interfaces (GUI's), games, multimedia publishing, scientific discovery and visualization, arts and creation, editing sound and images, vehicle industry, engineering, manufacturing, tele-robotics and tele-operation, education and training, medical simulation and rehabilitation.
- Consequently, haptic research and development has been focused to design and evaluate several prototypes of different characteristics and capabilities for use in virtual environments. Recently some of these prototypes have become commercially available in the market. Haptic interfaces are becoming part of research studies being conducted in many disciplines such as neuroscience, robotics, virtual reality, and medicine and although they are not yet as commonplace a tool as the computer itself is today in our environment, they are gaining ground in terms of usage in real-world applications, and, like any other system, authentication and/or verification of users becomes a necessity. Hence, in this work we set out to create such authentication and verification system for applications that use haptic Tools and instruments.

Example right away



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The payload of your paper

Introduce the problem, and your idea, using

EXAMPLES

and only then present the general case



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The details: evidence

- Your introduction makes claims
- The body of the paper provides **evidence to support each claim**
- Check each claim in the introduction, identify the evidence, and forward-reference it from the claim
- Evidence can be:
 - analysis and comparison,
 - theorems,
 - measurements, and
 - case studies



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Approach

- Generalize your work in an abstraction level, e.g., positioning it as a framework rather than a tool
 - Scientific contribution should be beyond yet another implementation
 - A workflow diagram is useful for explaining your framework
- Try to separate the ideas from (a particular) concrete implementation
 - But sometimes you have to mention it a bit and refer the readers to the implementation section.
- Explain some details with examples (even if you have illustrated your high level ideas in the example section)



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Evaluation

- Experiment:
 - Hypotheses/Questions to be answered
 - Measures you use to answer these questions (higher better?)
- Case studies:
 - Could involve human subjects
 - often require careful preparation (tasks, questionnaires, interviews, etc.)
 - lessons learned
- Feasibility studies:
 - not directly assess or apply the approach on the real environment but give hints on feasibility



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Implementation

- What libraries you used in your tool
 - e.g., Java3D, X3D, CHAI-haptic API
- Detailed implementations of each step in your framework
- List complications of implementing a certain idea and how you get around them
 - if some complications are important and general, you may move them to the framework section.



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Evaluation

- Experiment setup:
 - a good number of entities/subjects, some scripts, some third-party tools or reimplemented tools for comparison
- Metrics
 - Independent variables + dependent variables
- Experimental results
 - Illustrate how to read your table/diagrams (columns, x/y axis, etc.)
 - Explain what does the curve or data mean, e.g., "We observed that ...", "The experimental results show ..."
 - Summarize your findings, remember to get back to answer the hypotheses and questions; it is ok to have an undecisive or negative answer based on the experimental results
- Need hypothesis testing:
 - t-testing especially if you want to say "A result is **significantly** better than B result"; statistically significant vs. practically significant
- Optional: discussion subsection; or you can put it as a separate section
 - Describe how the results relate back to which hypotheses and how hypotheses relate back to which research questions



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Discussion

- Discuss limitations and issues your approach/implementation currently cannot address
 - Optional: how are you going to address them in future work
- It is often a good idea to list (obvious) limitations and discuss possible solutions for them rather than hiding them
 - Reviewers can often identify obvious limitations even if you don't state them; then they will criticize your work on these limitations
 - you often don't have a rebuttal against these criticisms in conference reviews).
 - If your paper discusses these obvious limitations as well as their potential solutions, the situation can be alleviated (it is like you have a rebuttal in your paper already before being criticized!).
- Possible applications of your approach that you haven't validated but are convincingly feasible or effective



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Related work

Fallacy To make my work look good, I have to make other people's work look bad

Giving credit to others does not diminish the credit you get from your paper

- Warmly acknowledge people who have helped you
- Be generous to the competition. "In his inspiring paper [Foo98] Foogles shows.... We develop his foundation in the following ways..."
- Acknowledge weaknesses in your approach



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Credit is not like money

Failing to give credit to others can kill your paper

If you imply that an idea is yours, and the referee knows it is not, then either

- You don't know that it's an old idea (bad)
- You do know, but are pretending it's yours (very bad)



Related Work

- Don't make unjustified unobvious criticisms on related work if you don't have experimental results to back you up.
 - But you can cite others' experiments to back you up.
- Don't overclaim your work without justification
- Don't intentionally leave out your own very related previous papers (reviewers can find them out easily)
 - maybe even need to mention them in Introduction section and explain why the new work is different
 - reviewers often try to identify a marginal/incremental paper or a "least publishable unit (LPU)" (Google this term!)
- Put in PC members' work if relevant ☺



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Related Work

- Where to put the related work section
 - After the introduction
 - Before the conclusion section
- After the introduction/example section
 - Pros: Immediately clear out reviewers' wonder on how the work differs from previous work
 - Cons: hard to let readers to know what you are talking about before showing the approach details
 - But it may be ok to put it after the example section
- Before the conclusion section
 - Pros: Now reviewers' know what your approach is about
 - Cons: reviewers keep wondering how the work differs from previous work till this point
 - But for very closely related work, you should have pointed out the differences in the introduction section



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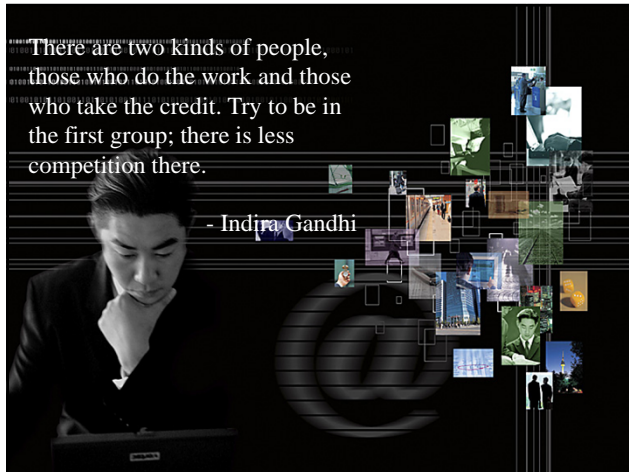
Conclusions and Future Work

- Should be brief
- Often easy to write conclusions
 - nothing here should surprise readers; simply summarize your contributions and findings
 - In the introduction, "We propose a new approach ..."
 - vs. In the conclusions, "We have proposed a new approach ..."
- You can state the broader impacts of your approach
- You can optionally describe limitations and future work here if you don't have a discussion section for them and propose future work



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Authorship

- Some journals use the alphabetical order
- Most of them assume an order based on each author's importance to the study
 - The first author is primarily responsible for collecting and analyzing data, and writing
 - The last one, an established investigator, assumes the overall responsibility for the study → 😊 **Your Professor** 😊
- The middle authors are listed according to their order of importance to the study



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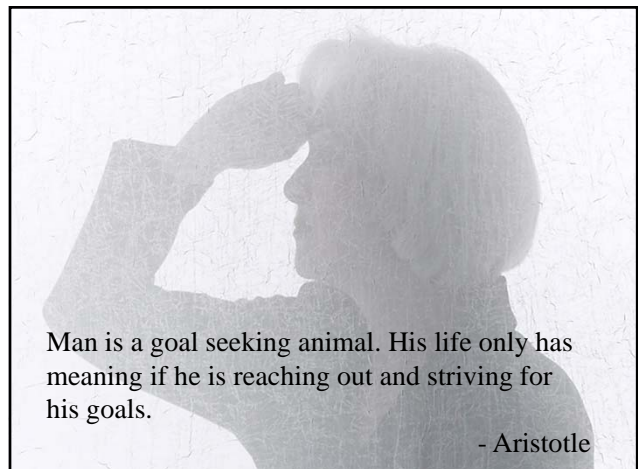
Authorship

- Should include persons who:
 - Can defend the intellectual content, including data and conclusions
 - Must be willing to concede publicly any errors
 - In the case of fraud be willing to state publicly the nature and extent, and account for its occurrence
- All the following criteria should be met:
 - Generate at least part of the intellectual content (conception or design, data analysis and interpretation)
 - Drafting, reviewing or revising critically for important intellectual content
 - Final approval of the version to be published



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Last Advices

- Where many of the papers cited were published?
- Where do cited scientists publish their work?
- Read the advertising statements of journals
- Read the "scope" paragraph in the "I for A"
- Read the table of contents of potential journals
- Examine several articles in potential journals



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Last Advices

- First Draft
 - Write as quickly as possible
 - As if thinking out loud
 - Get everything down
 - Ignore spelling, grammar, style
 - Skip troublesome words
 - Correct and rewrite only when the whole text is on paper

**Do not split the 1st manuscript
among the co-authors**



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Last Advices

- Fix a schedule
 - Monitor progress
 - Write by a biological clock
 - When time is short: prepare, revise
 - One page a week: **torture**
- Location → Skip trouble spots
 - Writer's block: unacceptable
 - Need stretch of several hours
 - Avoid distractions: phone, beeper
 - Choose a very boring area → Nothing to distract



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Last Advices

- All first drafts have too many words
 - Successive drafts: prune vigorously
 - Strip every sentence
 - Look for excessive adverbs, adjectives
 - Writing improves in proportion to deletion of unnecessary words
- Tense
 - Previously published work: present tense
 - Your own work: past tense
- Voice
 - Active more precise and less wordy than passive
 - Name the agent, even "I" or "we"
- Singulars and plurals
- Words don't do justice to your ideas
 - If multiple mistakes in spelling and syntax, reviewer suspects similar negligence in the lab



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Last Advices

- Content, accuracy
- Clarity
- Precision
- Logic
- Order of presentation
 - Clear
 - Exact
- Ambiguity, inconsistency
- Concise
- Least words
 - Short words
 - One word vs many

a majority of = most
 at the present time = now
 give rise to = cause
 in some cases = sometimes
 is defined as = is
 it is believed that = I think
 on the basis of = by
 pooled together = pooled
 subsequent to = after
 with the result that = so that



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Credits

- Tao Xie
 - Department of Computer Science – North Carolina State University
 - <http://www.csc.ncsu.edu/faculty/xie/>
- Nitin H. Vaidya
 - University of Illinois at Urbana-Champaign
 - nhv@uiuc.edu
- Simon Peyton Jones
 - Microsoft Research, Cambridge
 - <http://research.microsoft.com/~simonpj/>
- Walter A. Zin, MD, DSc
 - Laboratory of Respiration Physiology – Carlos Chagas Filho Institute of Biophysics, Federal University of Rio de Janeiro



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Failure is impossible.

- Susan B. Anthony

Relevant Lit.

- Some guidelines on doing/writing experiments
 - "Experimental program analysis: A new program analysis paradigm." ISSTA 06
<http://esquared.unl.edu/articles/downloadArticle.php?id=208>
<http://esquared.unl.edu/wikka.php?wakka=ExperimentalProgramAnalysis>
 - <http://www.acm.org/crossroads/xrds7-4/empirical.html>
 - <http://www-static.cc.gatech.edu/~harrold/8803/Classnotes/>
 - Notes of Weeks 18, 19, 20, and 21
- Some relevant papers/examples of doing/writing various types of evaluation
 - <http://www.cs.washington.edu/education/courses/590n/04sp/>
- Experiments vs. Case Studies
 - "Evaluating emerging software development technologies: lessons learned from assessing aspect-oriented programming" by Murphy et al.
<http://ieeexplore.ieee.org/search/wrapper.jsp?arnumber=799936>
- A good book on case study research in general
 - "Case Study Research : Design and Methods" by Robert K. Yin
 - http://www.amazon.com/gp/product/0761925538/104-9365607-2004707?pf_rd_p=glance&n=283155



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- <http://spoke.compose.cs.cmu.edu/ser04/course-info.htm>
- <http://www.cs.cmu.edu/~Compose/shaw-icse03.pdf>
- <http://infolab.stanford.edu/~widom/paper-writing.html>
- <http://www.cse.msu.edu/~chengb/Writing/intro-guidelines-stirewalt.txt>
- <http://www1.cs.columbia.edu/~kaiser/relatedwork.htm>
- <http://pag.csail.mit.edu/~mernst/advice/write-technical-paper.html>
- http://www-bsac.eecs.berkeley.edu/~muller/j/mems.web/sds_editorial_june_2003.pdf
- <http://www.cs.berkeley.edu/~pattsrn/talks/writingtips.html>
- <http://www.csc.ncsu.edu/faculty/xie/publications/writeissues.pdf>
- <http://www.csc.ncsu.edu/faculty/xie/advice.htm#writing>
- <http://www.csc.ncsu.edu/faculty/xie/adviceonresearch.html>
- <http://www.csc.ncsu.edu/faculty/xie/publications/writingtools.html>
- <http://www.csc.ncsu.edu/faculty/xie/seconferences.htm>

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THANK YOU Dank Teseckürler Alvato

谢谢! Bedankt

Gracias Dankie شکر Grazie Reszönettel

Obrigado! Diky

ありがとう! 감사합니다

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