Part 6

- ***Reading research papers***
- ***Structure of a research paper***

Research Methods in Computer Science

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Reading research papers

- Research aims to add the world's body of knowledge
  $\rightsquigarrow$ Requires a researcher to be aware of what the world's body of knowledge (in the area s/he works in)

- Frontiers of the world's body of knowledge are not documented in text books, but in

reliability $\uparrow$ journal articles
conference papers
workshop papers
technical reports
$\downarrow$ timeliness

Getting organized

- Maintain a database of all the books and papers you read
- Data stored should at least include title, author, place of publication, and storage location
- Preferably you should also keep a record of the answers to some or all of the following questions:
  1. What is the main topic of the article?
  2. What was/were the main issue(s) the author said they want to discuss?
  3. Why did the author claim it was important?
  4. How does the work build on other's work, in the author's opinion?
  5. What simplifying assumptions does the author claim
  6. What did the author do?
  7. How did the author claim they were going to evaluate their work and compare it to others?
  8. What did the author say were the limitations of their research?
  9. What did the author say were the important directions for future research?

Evaluating research papers

- Whenever you read a research paper, you should try to evaluate at the same time.
- Try to answer the following questions:
  1. Is the topic of the paper sufficiently interesting (for you personally or in general)?
  2. Did the author miss important earlier work?
  3. Are the evaluation methods adequate?
  4. Are the theorems and proofs correct?
  5. Are arguments convincing?
  6. Does the author mention directions for future research that interest you?
- Given the answers to these questions for a number of research papers, you should be able to construct a research proposal by considering how you could improve the work presented in them

Structure of a research paper

1. Title
2. List of authors (and their contact details)
3. Abstract
4. Introduction
5. Related Work (either part of or following introduction or before summary).
6. Outline of the rest of the paper
7. Body of the paper
8. Summary and Future Work (often repeats the main result)
9. Acknowledgements
10. List of references

1. Title

- As short as possible, but without abbreviations or acronyms
  (unless they are commonly understood)
- As specific as necessary and as general as possible
  (e.g. 'The Complexity of Theorem-Proving Procedures'
  $\rightsquigarrow$ introduced the notion of 'NP-Completeness'
  $\rightsquigarrow$ starting point of complexity theory)
- Include key phrases which are likely to be used in a search on the topic of the paper
  (e.g. 'modal logic', 'calculus', 'decision procedure')
- Avoid phrases which are too common
  (e.g. 'novel')
- Use phrases that describe distinctive features of the work
  (e.g. 'Real-world Reasoning with OWL')

2. Authors

- An author of a paper is an individual who
  1. made a significant intellectual contribution to the work described in the paper
     (in contrast, for example, to a monetary contribution);
  2. made a contribution to drafting, reviewing and/or revising the paper for its intellectual contribution
     (in contrast, for example, to spell checking or typesetting); and
  3. approved the final version of the paper including references

  Some organisations / publishers have strict rules regarding authorship
- Order of authors may depend on
  - subject area: pure theory $\rightsquigarrow$ often alphabetical
    applied research $\rightsquigarrow$ often based on contribution
  - research assessment
    (e.g. bibliographic measures associating order with contribution)
  - cultural context

Eserdeki Yazar Sayısı	Hak Edilen Puan (Ön Görülen Tam Puan Listesi)		
	1. isim%	2.isim %	3.isim%
1 İsimli	100		
2 İsimli	80	50	
3 İsimli ve daha fazlası	50	25	25
Yazarın Belirtilmediği 2 veya daha fazla yazarlı makale	50	50	50
Diğer Yayınlarda (Bildiri, Kitap, Kitap bölümü v.b.)	33,33	33,33	33,33

2. Authors

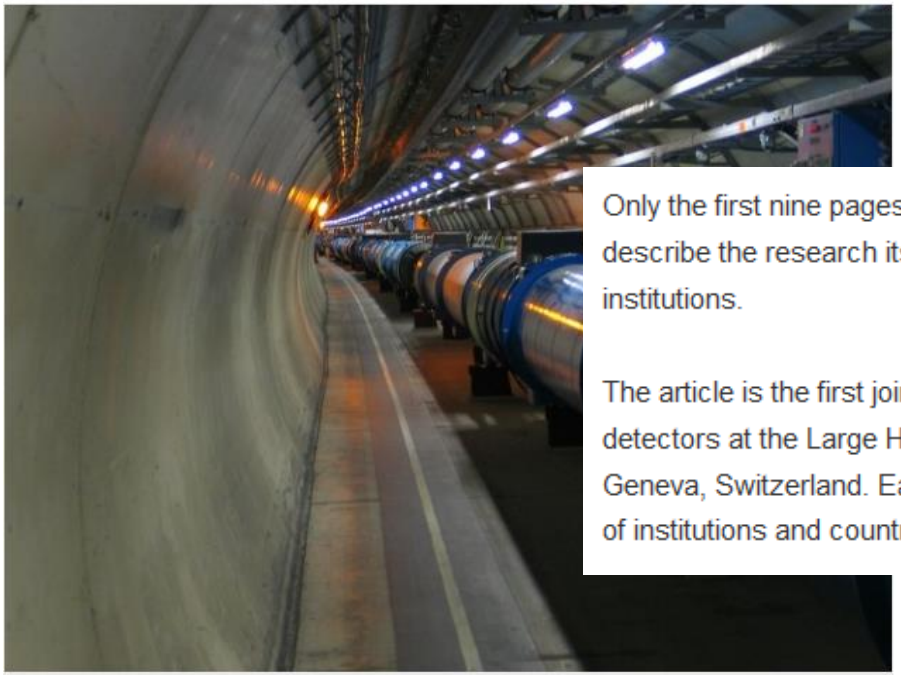
NATURE | NEWS

Physics paper sets record with more than 5,000 authors

Detector teams at the Large Hadron Collider collaborated for a more precise estimate of the size of the Higgs boson.

Davide Castelvecchi

15 May 2015



CERN

Thousands of scientists and engineers have worked on the Large Hadron Collider at CERN.

A physics paper with 5,154 authors has — as far as anyone knows — broken the record for the largest number of contributors to a single research article.

Only the first nine pages in the 33-page article, published on 14 May in *Physical Review Letters*[1], describe the research itself — including references. The other 24 pages list the authors and their institutions.

The article is the first joint paper from the two teams that operate ATLAS and CMS, two massive detectors at the Large Hadron Collider (LHC) at CERN, Europe's particle-physics lab near Geneva, Switzerland. Each team is a sprawling collaboration involving researchers from dozens of institutions and countries.

hyperauthorship

2. Authors

- In Computer Science, academic degrees and membership of professional organisations are typically not indicated
- List of authors is typically followed by contact information consisting of affiliation and e-mail address (not postal address)
- Some journals allow authors to provide longer descriptions of themselves including photographs

3. Abstract

- Typically not more than 100–150 words
- Should aim to motivate people to read the paper
- Highlight the problem and the principal results
- The abstract will be included in literature databases
  - ⇝ Make sure key phrases which might be used in searches are included (same principle as for titles)
- Keep references to a minimum
- Keep equations and other mathematical expressions to a minimum

4. Introduction

- State the general area of research
  (unless this is obvious from the context in which the paper appears)
- Introduce the problem
  state why the problem is important and/or interesting
- Outline the approach taken to solve the problem
- Outline the solution or principal results
  state why the results are important and/or interesting
- Do not repeat the abstract
- Avoid platitudes and cliches

5. Related work

- Related work is previous work by the same or other authors which addresses the same or closely related problems / topics
- Section on related work gives credit to such work and establishes the originality of the current work
- Extent depends on the space available and relevance of the related work to the work presented in the paper

  Within these two constraints, make sure all related work is cited and correctly described
- Failure to give credit can result in a bad evaluation and kill your paper
- Section on related work is either part of the introduction or is placed at the end of the body of the paper or following

6. Outline of the paper

- Typically at the end of the introduction
- Describes the content of the body of the paper section by section

Example:

> *The remainder of the paper is organised as follows. In Section 2, we introduce . . . Section 3 describes . . . Finally, we describe future work in Section 5.*

(Note that 'Section' is capitalised.)

7. Body of the paper

- Depends strongly on subject area and topic of the paper
- Typical structure of a Computer Science paper on theoretical research:
  1. Basic definitions
  2. Description of a new algorithm, calculus, or formalism
  3. Sequence of theorems accompanied by proof or proof sketches
  4. Applications / consequences of the results (optional)
- Typical structure of a Computer Science paper on applied research:
  1. Architecture of a new system
  2. Description of the realisation
  3. Evaluation
- Combinations of the two are possible and quite typical
- Papers on action research, case studies, surveys, experiments are also common and have their own structure

8. Conclusion and future work

- Summarises the contributions of the paper
- Describes the implications and/or applications of the contributions made by the paper
- Outlines future directions of research

9. Acknowledgements

- Acknowledges external funding sources
- Thanks non-authors that made a significant contribution
  - colleagues or fellow researchers with which the authors had discussions related to the topic of the paper
  - anonymous referees provided they have given exceptional level of feedback or important insights

Hints

Top-down design: Start with an outline, then fill in the details

Inside-out writing: Fill in the body of the paper first, then write introduction, related work, conclusion; finally, write the abstract

Diagrams/Tables: Are all diagrams and tables readable? Can they be understood?

Dependency analysis: Is the paper self-contained and are notions presented in the correct order?

Factuality: Make sure everything stated in the paper is factually correct

Interpretability: For each sentence check whether it could be misread; if so, try to fix it

Optimisation: Remove unnecessary parts, shorten exposition

Readability: Does it read well? Are all parts interconnected?

Academic writing tools and software


Microsoft Word


LaTeX


Open Office


Libre Office


Scrivener


Google Docs


DropBoxPaper

- ...

Grammar checkers and sentence correction tools

- MS Word spelling and grammar checker
- Grammarly
- ProWritingAid
- CorrectEnglish
- StyleWriter
- WhiteSmoke
- Ginger Software
- Online grammar checking sites (many)
- ...

End of part 6

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- ***Structure of a research paper***

https://www.ref-n-write.com/trial/academic-writing-tools-and-research-software-a-comprehensive-guide/

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