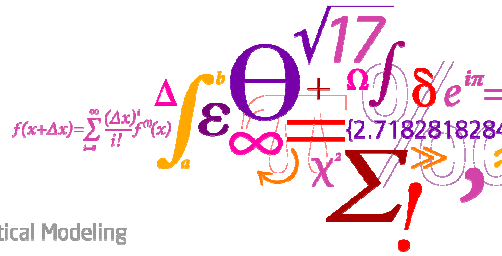


Reading a Scientific Paper

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Why Read Scientific Papers?

- Scientific papers contain the newest information on a topic
- Relevance of information in publications
 - Monographs (textbooks)
 - Comprehensive information on broad topics
 - Knowledge can be old
 - Often only updated every 5 – 10 years
 - Journal Articles
 - Comprehensive information on narrow topic
 - Knowledge may show age
 - Often takes more than one year to publish
 - Conference/Workshop Articles
 - Specific information on narrow topic
 - Knowledge is normally fresh
 - Normally takes less than six months to publish

Structure of a Scientific Article

- Scientific articles normally consist of three parts:
 - Part I
 - Title
 - Abstract
 - Part II
 - Introduction
 - Methods
 - Results
 - Part III
 - Discussion
 - References

Title + Authors + Affiliations

- What is the topic of the paper?
- Names of all the authors
 - Ordered by contribution
 - Most contributing author first
 - Ordered alphabetically
 - Gives no clues about individual contributions
 - Identifying authors gives clues about the contents
 - Are the authors well respected?
 - Do they normally work in this domain?
- Affiliation of all the authors
 - Are the institutions well respected?
 - Papers from top research labs/universities are generally good
 - Where can I contact authors if I have questions?

Abstract

- Summarizes
- Often only part read
- Don't act on abstracts alone
- Structured abstracts are norm
 - Background
 - Methods
 - Results
 - Conclusions

Introduction

- Context
- What is already known
 - There is often a separate section outlining “related work” at the beginning or near the end of the paper
- Supporting literature (citations)
- Gaps in literature
- The research question
- Novelty
- Relevance to field

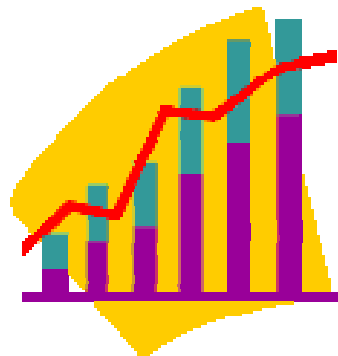
Methods

- Steps taken to
 - gather data
 - analyze data
- Statistical methods
- Not a “cookbook”
 - Many (important) details may be omitted for brevity
- Replicable



Results

- Experiments used to evaluate the hypothesis
 - Parameters used when running the experiment
- Report of data
- Tables and graphs
- Statistical results
- No interpretation



Discussion

- Interpretation of results
- Answer to research question
- Have the goals been met?
- Often includes
 - relation to previous research
 - limitations
 - future directions

References

- List of sources cited in intro
- Usually other journal or conference articles
 - May also include Ph.D. theses, M.Sc. theses, technical reports, user manuals, web sites, news items, etc.
- Previous studies in same field
- Citation styles differ depending on
 - Field of study (*e.g.* AMA vs. APA)
 - Journal may have their own style
 - Conferences sometimes have their own style (LNCS)

Conference Article References

- Adler, B. T. and L. de Alfaro, A content-driven reputation system for the wikipedia, in: Proceedings of the 16th International World Wide Web Conference, Banff, Alberta, Canada, 2007, pp. 261–270.

- List of authors
- Title of article
- “In Proceedings of ...”
- Conference identification
 - Instance
 - Name
 - Location (city, state/province, country)
 - Dates (or simply the month and/or year)
- Pages

Journal Article References

- Peter Denning, Jim Horning, David Parnas, Lauren Weinstein: Wikipedia Risks. In: Communications of the ACM, Volume 48, Issue 12 (December 2005), COLUMN: Inside risks, pp. 152-152, 2005

- List of authors
- Title of article
- Journal name
- Volume number
- Issue number
- (column name)
- Pages
- Year (this can normally be inferred from the volume number)

- Communications of the ACM, Volume 48, Issue 12 (December 2005)
 - Sometimes abbreviated CACM 48(12)

Why are the References Important?

- It helps locate the basic work that the paper is based on
- It helps locate papers that describe related work
 - Other solutions to the same problem
 - Other authors who propose similar solutions
- Science citation index (SCI)
 - Identifies papers that cite a specific paper
- Paper's references used together with SCI allows:
 - Identification of other papers that work in the same area
 - Because they reference the same papers
 - Process may be iterated a number of times
 - Identify all papers that are worth citation

Reading a Paper

- Two styles of reading: *active* and *passive*
- Passive reading
 - Read through the paper without stopping to think
 - Difficult bits may become clear later
- Active reading
 - Get into question-asking mode
 - doubt everything
 - nit-pick
 - find fault
 - just because it's published, doesn't mean it's right
 - get used to doing peer review
 - use highlighter, underline text, scribble comments or questions on it, make notes
 - if at first you don't understand, read and re-read, spiralling in on central points
- Often a good idea with one or two iterations of passive reading before beginning on the active reading



Reading a scientific paper

- Move beyond the text of the paper
 - talk to other people about it
 - read commentaries
 - consult, dictionaries, textbooks, online links to references, figure legends to clarify things you don't understand



Blame the authors if...

- Logical connections left out
 - Instead of saying why something was done, the procedure is simply described
- Cluttered with jargon, acronyms
- Lack of clear road-map through the paper
 - side issues given equal air time with main thread
- Difficulties determining what was done
 - Ambiguous or sketchy description
 - Endless citation trail back to first paper
- Data mixed up with interpretation and speculation

Evaluating a paper

- What questions does the paper address?
- What are the main conclusions of the paper?
- What evidence supports those conclusions?
- Do the data actually support the conclusions?
- What is the quality of the evidence?
- Why are the conclusions important?

What questions does the paper address?

- Descriptive research
 - often in early stages of our understanding can't formulate hypotheses until we know what is there.
 - e.g. work load characteristics, user behaviour, measurements of new hardware/technologies ...
- Comparative research
 - Ask how general or specific a phenomenon is.
 - e.g. comparison of performance measurements

What questions does the paper address?

- Analytical or hypothesis-driven research
 - test hypotheses
 - e.g. specific organisation of a system will improve performance
- Methodological research
 - Find out new and better ways of doing things
 - Describe new resources
 - e.g. description of new security mechanisms, cryptography, etc.
- Many papers combine all of the above

What are the main conclusions?

- First look at Title and Abstract, then Discussion
- Do they matter?
 - Of general relevance?
 - Broad in scope?
 - Detailed but with far-reaching conclusions?
 - Accessible to general audience?

What evidence supports them?

- Look at Results section and relevant tables and figures
 - May be one primary experiment to support a point
 - More often several different experiments or approaches combine to support a particular conclusion
 - First experiment might have several possible interpretations, and the later ones are designed to distinguish among these
- In the ideal case, the Discussion begins with a section of the form "Three lines of evidence provide support for the conclusion that ..."

Judging the quality of the evidence

- You need to understand the methods thoroughly
 - may need to consult textbooks
- You need to know the limits of the methods
 - e.g. an assumption about system usage patterns has to be treated as working hypothesis rather than fact
- Separate fact from interpretation
- Are the results expected?
 - Extraordinary claims require extraordinary evidence

Judging the quality of the evidence

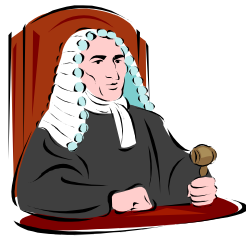
- Look at details, assess them for plausibility
 - The veracity of whole depends on the veracity of its parts!
 - e.g. look at system properties, what is missing but expected, what is present, but unexpected?
- Where are the controls?
- What is the gold standard?
 - e.g. when examining biometric authentication scheme, how can you assess accuracy?

Do the data support the conclusions?

- Data may be believable but not support the conclusion the authors wish to reach
 - logical connection between the data and the interpretation is not sound (often hidden by bad writing)
 - might be other interpretations that are consistent with the data
- Rule of thumb
 - If multiple approaches, multiple lines of evidence, from different directions, supporting the conclusions, then more credible.
- Question assumptions!
 - Identify any implicit or hidden assumptions used by the authors in interpreting their data?

Conclusions

- Final assessment is up to you!
 - Scientific progress is based on peer review



You are the judge!!!