

CSIP5403: Research Methods and Applications

Lecture 4: Critical Evaluation of Research

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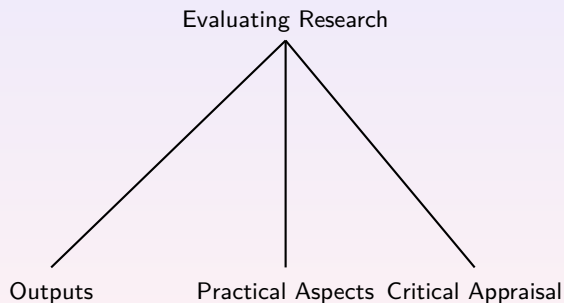
Outline

- 1 Introduction
- 2 Research Outputs
- 3 Reading Research – Practical Aspects
- 4 Reading Research – Critical Evaluation
- 5 Some Other Issues
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Motivation

- To understand previous work in your research field
- To be able to *critically evaluate* that research
- To highlight opportunities to build on that research
- To not repeat other peoples work!

Three Aspects



Types of Research Outputs

- Conference Papers
- Journal Papers
- Research Monographs
- PhD Theses
- Web Based Reports

Why Write a Conference Paper?

Why do researchers write conference papers?

- Usually ongoing work
- Testing ideas with peers
- Date stamping work
- To meet like minded people and exchange ideas

Structure of Conference Papers

A typical conference paper will:

- Be short - usually 6-8 pages
- Limited literature review
- Have work in progress results
- Typical breakdown (although it can vary)
 - Background 1.5 pages
 - Description of work 2 pages
 - Results 1.5 pages
 - Conclusions and References 1 page
- Refereeing Process varied

Some Computational Intelligence (CI) Conferences

There are (too) many . . .

- UKCI - UK Based Workshop
- RASC - UK Based International Conference
- IASTED Series - International Conferences
- IPMU & EUSFLAT - Top European Fuzzy
- PPSN - Top European conference
- FUZZ-IEEE, IEEE-NN, CEC - Top conferences in world, very high standards

Journal Papers

This is difficult . . .

- Journals vary considerably
 - Length allowed
 - 'Standards' expected
 - Theoretical/Applied axis
 - Review papers
- Theoretical papers expect proofs
- More applied papers expect *considerable* results
- Extensive Literature Review required
- Usually thorough reviewing process

Some Example CI Journals

There are lots, of varying quality. See ISI Web of Science

- Fuzzy Sets and Systems
- Neurocomputing
- Evolutionary Computation
- Soft Computing
- IEEE Transactions on Fuzzy Systems
- IEEE Transactions on Neural Networks
- IEEE Transactions on Evolutionary Computation
- IEEE Transactions on Cybernetics
- Many Application led CI journals (e.g. Artificial Intelligence in Medicine)

Research Monographs

- book on a research topic
- collection of works, or
- part of a Phd, or
- specially commissioned book on a research topic

PhD Theses

- Available in libraries or online
- Useful resource
- Although, look for papers by the author

Web Based Reports

- Treat with Care . . .
- Why not in journal or conference?

So What Have We Learnt About Research Outputs

- Various types
- Different Reasons
- Different Lengths
- Different Levels of Quality

Reading Ladder – Strategic Reading Steps

- Before you start note taking:
 - Read the title (usually descriptive)
 - Read: a) the subheading to the title if there is one; and b) the sub-headings within the article
 - Look at captions, titles of tables or figures. Consider the relevance of the graphic data
 - Read the abstract (or summary) at the top. This should say why, how, what was done
 - Read the conclusion
 - Read the introduction
 - Ask yourself: a) How does this article address my research statement? b) Will I likely find useful information in this article?
- When you have decided that a source is relevant, read it in detail and take effective notes

Some Practical Tips

- Keep Good Records
 - Keep a database of papers
 - Use latex and bibtex (covered later)
- Use highlighter pen for key points
- Follow up references in paper (can take a while)
- Write your own synopsis/key words

Critical Reading

- The main point of critical evaluation is to *think* about what you read, i.e., *Critical Reading*
- A critical reading is
 - ‘One that goes beyond mere description by offering opinions, and making a personal response, to what has been written’
 - ‘One that relates different writings to each other’
 - ‘One that does not take what is written at face value’
 - ‘One that views research writing as a contested terrain, within which alternative views and positions may be taken up’
- Using the above pointers will ensure that you develop a deeper understanding of your topic

What We Want from the Literature

Concepts will be useful to guide your observations

Theories to compare and maybe use in your explanation or description

Definitions of the topic, issue or problem to compare and from which to construct your own working definition

Arguments over what something means, how it should be defined and studied

Data and evidence which can be evaluated

What Is Critical Evaluation?

- It interrogates the work of others by scrutinising chain of reasoning used and evidence offered to support their arguments

You Are Aiming

- to follow the use of a seminal work by successive authors
- to evaluate their assessments and use of that work
- to evaluate the synthesis which have been developed with other land-mark publications

Finding the Gap

- Your reasons for doing this are
 - to identify fallacies in arguments, methodological assumptions or theory; or
 - to show how an issue or problem could benefit from the application of an existing theory and/or methodology
- This is **finding the gap** for your research
 - The basis for making an argument that your research will make an original contribution to knowledge (doctorate level); or
 - demonstrate the application of theory and methods (master level)

What Is Evidence

- Evidence is a core requirement for argument, interpretation and recommendation
- Evidence is subject to the rules of proof, authentication and production
 - Statements made must (now or hypothetically in the future) have a corresponding proof
 - The proof must be authentic: not false, not incomplete
 - The proof must be able to be produced in full, and, if possible, in its original state. It must be replicable: other researchers must in principle be able to produce the same results using the same methods

Evaluating Arguments

- The proposer of an argument needs to marshal sufficient and relevant evidence to support the argument
- The method by which this is accomplished is producing valid, sound and coherent arguments devoid of fallacies and not easily undone
- The evaluator of an argument needs to
 - identify the structure of the reasoning used
 - look carefully at the premises and conclusions
 - seek to show why the produced conclusion is not the only one to be derived from the reasons provided
- Some sound advice is to start with the main conclusion C, ask
 - What immediate reasons are presented in the text for accepting the conclusion C?
 - Why (in the text) are you asked to believe C?

Critical Thinking

- It is needed to evaluate argument, evidence and practices
- It involves developing the ability and capacities to be sceptical
- It is about asking questions about an argument in a systematic way based on consistent application of the assertibility question

Basic Steps for Critical Evaluation

Once you have identified the main publications, group them roughly into sets based on similarity of argument

- For each set, itemise reasons given for conclusions made.
- Think about the reasons and conclusions. Ask what assumptions have been made, what are the origins of these assumptions, were they necessary, what other assumptions could have been used?
- Think about the logical consequences of the conclusions made based on the assumptions underpinning them. Look for distinctive chains of reasoning and new ideas
- Assign weights – high weight to strong chains of reasons with throughout conclusions and low weight to weaker chains of reasoning
- Use mind maps and relevance trees as tools to organise and evaluate the relative usefulness (strengths) of the different camps and individual studies

How Do I Evaluate Research?

Sound Statistics?

Does It make Sense?

Do they reference Key Works?

What More Would You Like to Know?

Check the Maths

What are the Key Points?

Are Experiments Repeatable?

What are the Key Points?

- What's the purpose of the paper?
 - Motivation?
 - Should be clear from the abstract
- Depending on the type of paper
 - Well written critical review?
 - Results?
 - Using good statistics?
 - Clearly presented?
 - Compares with other approaches?
 - Theoretically sound?

Does It Make Sense?

This is difficult to explain and only comes about with practice . . .

- English ok?
- Well structured?
- Tells a story?
- Everything there for a reason?

Some Other Issues – The Authors

- Do they have a 'track record'?
- Read between the lines in the author list.
- Check other sources (e.g., source codes if available) for their papers

Some Other Issues – Intangibles

- Interesting?
- Is it referenced by other works you have read?
- Worth checking out their web sites for more ...

In Conclusion

- Lots of things to consider
- Experience will help
- Only can really get knowledgeable by 'doing'
- If it's good
 - It's worth spending time on
 - Follow up references