Research Skills

WORKSHOP 3

DR. MARKUS HOFMANN

This Week – Literature Review

- How to source good materials
- How to read papers/journals/articles
- Penning the literature review
- Critical Analysis
- References/Bibliography

How to source good reading material

- When undertaking a research project, your reading list will be made up of:

  - Books, core texts to familiarise yourself with the area and will serve as a reference for the duration of the project.
  - Academic publications: These are normally either journal or conference papers that have been peer reviewed and subjected to critical appraisal. Conference papers tend to describe research that is in-flux where as journal papers tend to describe research that has reached a level of completeness.
  - Conferences are meetings of researchers who work in a particular area where they can present/discuss their research, make contacts and collaborations and have some fun.

How to source good reading material

- Journals are periodic releases of the state of the art in a research area. Each issue (could be monthly) will have a number of papers, each one describing a research question and associated methodologies, results etc. Research in journals is normally more advanced than that in conferences. Some journals are considered more prestigious than other in the same area and demand research of a high quality for acceptance.
- Technical reports\Dissertations: Some authors like to publish their work in a technical report before submitting it to a conference/journal. This can be useful to stake a claim as the peer review process can be quite long.
- Tutorials: You may find a number of tutorials on the web that might be good. These might be hosted by one of the leading figures in the area.

How to source good reading material

- So that's the type of content, but how do you find it?
  - Before deciding on which core text(s) you will use it is worth reading some reviews on the book or perhaps a sample chapter (a lot of authors/publishers make these available. Normally there will be some stand out books that most researchers in the field have a copy of. Find out what these are and get a copy either from your library if available, inter library loan or from amazon or some other book store.
  - Conference and Journal papers – There are a number of online conference/journal databases e.g. IEEExplore, Science Direct, Springer etc. that provide keyword search capability. Most of these will allow you to read abstracts for free which should give you an indication as to the relevance of the paper. The full version is normally expensive but your college may have a subscription that allows viewing the full version. ITB have a subscription to IEEExplore, ScienceDirect which has papers on a number of technical disciplines. Springer also offers the computer science reading room, a free service where selected journals are made available for viewing/printing. Don't forget the inter-library loan route also. You are allowed a number or these per year.

How to source good reading material

- You will also find some papers/technical reports published on an authors website and there are search engines for these types of work, e.g. google scholar, citeseer and citeseerX (new version). Here you can search by keyword, author etc.

- Tracking references:

  - When you find a paper that is particularly relevant this can start the review process in earnest.
  - You will normally read about other work in the paper that is also very relevant and then when referring to the bibliography you track the reference
  - This process then will repeat itself until you have read all the major works in the area.
  - Only then are you in a position to assess the current state of the art, form an opinion on the leading work in the area, identify gaps in knowledge etc.

How to read academic publications

- You may think this is a no-brainer and you read it like any other article you have ever read but experience would suggest otherwise
- When you have sourced a paper that you think may be relevant you should first of all perform some shallow reading. Glance through the paper to get a feel of what it is about exactly, titles can sometimes be misleading. This might take half an hour or so.
- If you are satisfied that the paper is relevant to your research question(s) then you read it in detail, deep reading.
- This will involve perhaps reading the paper a number of times (well some sections as least) and perhaps using a text to help with some of the understanding. Deep reading of a paper can take a while. Don't be too concerned if it takes a number of hours to fully read and understand a research paper. It wouldn't be uncommon for a graduate student to spend weeks understanding a paper.
- Don't be too concerned either if you do not fully understand a particular section unless this is crucial to your work.

How to read academic publications

- When reading in detail you should read with a number of questions in mind about the work. The following would be quite common:
  - How relevant is this work to your research topic?
  - Is this work original, or have you read something very similar already?
  - Does the introduction/literature review put the research question in context?
  - Are the arguments for the hypothesis put forward in a manner that is clear and unambiguous?
  - Are the research methodologies used appropriate for this research? Can you think of any alternatives?
  - Are the methodologies described in sufficient detail, i.e. that one could reproduce?
  - Is there both quantitative and qualitative results? Are they timely? What claims are made?
  - How well are the results presented? Does the end justify the means?
  - Can the work be compared to similar work in the area? Is there enough information to make the comparison?
  - Are adequate conclusions drawn with suggestions for further work?

How to read academic publications

- By answering these questions you should be able to form an informed opinion on the quality of the paper.
- A good paper will have a detailed literature review and introduction that provides context for the research. It will outline and describe the methodologies in a way that is clear and comprehensible. It will provide qualitative and quantitative results that illustrates the answer to the research questions. It will provide a discussion of these results with perhaps a comparison to other work and will draw some conclusions from which further work may emanate.
- As you won't remember every detail about every paper you have read when it comes to writing your literature review you should write down the key points of a paper as soon as you read it. A template is always a good idea for this:
  - Title: The title of the paper
  - Reference: authors and where it appears
  - Main research question(s) under investigation: Main questions under investigation
  - Methodologies used: Here say which techniques are used with a brief description of the technique if relevant. Mention any other possible approaches
  - Results obtained: Mention the outcome of the research and how this compares to similar work.
  - Your opinion: Outline the strong points of the work and the weak points.

Penning the literature review

- The template is a must really for relevant work. For work that is loosely related to what you are doing a few lines describing it will do.
- You should only be writing your literature review after you have exhausted the literature and are exhausted reading ☺
- Reading can be painful sometimes but is vitally important in any research project.
- Before you begin you should have notes (templates, summaries etc.) on all research articles you have read. If these are comprehensive then you won't have to go back to the papers to remind yourself what was being described.
- You should categorise the articles you read according to sub-areas or specific research questions, e.g. in a machine vision project you normally acquire an image and then process it. Some papers may be on image acquisition approaches, others may be on image processing.
- Once this is done you are in a position to start piecing together the lit review. The format for this has some room for personal style and creativity but there are some bare essentials. You should read related work sections in papers and other dissertations to get a flavour of what is involved before writing your own.

Penning the literature review

- This will not be the first section of your thesis or of an academic paper. That is normally an abstract, followed by an introduction. The abstract is a brief overview of the paper/thesis. The introduction provides some background on the area and serves as a means to set up the research question (more on these later).
- Not everything you read will appear in your literature review. It is not a mere catalogue of references saying so and so did this, and such and such did that etc.
- Related work should merit mention in your work. Maybe the related work was a precursor to the problem you are looking at. Maybe it is a different approach but the same outcome. Maybe the same/similar approach but different outcome? Maybe a related but slightly different problem/area.
- A related works section is an opportunity to present the evolution of ideas in your area and how the problem addressed in your dissertation relates to these ideas. So the ultimate goal is to place your work in the context of all the previous work (which has already merited what you are striving for: acceptance and publication in most cases).
- Frequently the related work section is chronological because current work builds on previous work. So it will explain how the state of the art was arrived at and what it currently is.

Penning the literature review

- The following kind of styling is not uncommon

  Work on the problem of face recognition began in 1989 when Soap et al. devised a robust technique for modeling facial shape [ref]. Following on from this, Bloggs et al. outlined the shortcomings and suggested an improvement involving the use of skin colour [ref]. More recently a number of techniques have been advocated that rely on the use principal component analysis (PCA) [ref],[ref]……[ref].

- More detail would be given on work that was especially relevant and also that was especially successful in answering the research questions.

- Details of the methodologies used can also be given when referring to a particular piece. It is important to mention the main outcome(s) of the work (results) as this indicates to the reader how effective this work is.

- Some academic publications are just review papers so these need to be quite well written and comprehensive before they get published. Worth looking at.

Critical Analysis

- It is okay to critique other work too, i.e. to mention their strengths and weaknesses as you perceive them but you better be sure of your claims (show evidence) and try to avoid sweeping statements.
- There is a lot of research published out there in a lot of different areas and it shows insight into an area when you can comment on the worth/merits of a paper and determine the shortcomings. Be careful though, it should not be all negative and you point out approaches that work particularly well too but ultimately you have to justify your own work in the context of all this related work.
- The following might give you a better idea, road sign detection.

  Soap and Bloggs demonstrated a technique that relies on the circular Hough transform [12]. This technique performed well on speed signs with a detection rate of 90% and a false positive rate of 3%. However, it requires a clear circular edge of a sign to be successful which may not be available in all environments. In particular, when signs are partially occluded (from overhanging trees for example) this approach will be less effective.

- See related work sections posted in moodle or in other works that you read for more examples of how to explain work.

References/Bibliography

- The references section or bibliography is very important as it shows an examiner/reviewer what you have read, how to find it and goes hand in hand with the related work section. It also delimits your work from that of others.
- There are a number of reference styles out there, e.g. Harvard, IEEE, Vancouver etc. Some journals require a particular style as do some supervisors ☺
- The one I use the most is the IEEE style as most of this covers a lot of conferences/journals in electronic engineering and computer science.
- No matter what style you choose there are some basic rules/guidelines that need to be followed. The main one is that you supply sufficient (overkill is ok) information so that the reader can find the reference if they so wish, i.e. make sure they are complete.
- Another is that the references are consistent in style. If the IEEE style guide says you should reference journals a particular way then its important to reference all journals this way.
- You should also make sure that all work cited in the text appears in the references section and that the numbering matches (for IEEE).

References – citation in text

- The converse is not a requirement for IEEE (making sure all references are cited in the text) but I think it is good practice particularly for new researchers as it avoids the temptation to throw anything in the references section to bulk it up.

- There are a number of ways to cite references in the text (IEEE style):
  - Without author name, e.g. In [1], they describe …….
  - With author name: Bloggs [2] shows in his work …..
  - at the end of a sentence: as mentioned in [3]-[5].
  - When more than 2 authors use the first author and *et al*.: In [6], *Soap et al*. show…

- For IEEE, you number references as they appear in the text (not alphabetical). So the first reference will be [1], the second [2] and so on.

- The references section then will have the reference numbers (also in square brackets) flush with the left margin in a column of their own. The reference details will be left aligned and appear to the right of the number. There a different formats for how books, journals, conference articles etc should appear. See IEEE style guide (on moodle) for more details.

References – other styles

- There are a number of other referencing styles available to authors. Some are specific to a particular discipline, e.g. Vancouver that is widely used in the medical sciences.
- Other popular styles are Harvard and Chicago. Which style you use can be dictated by the publication body, the department or college you are attending or your supervisor or advisor.
- The Harvard style is a popular generic style of referencing that contains author-date references in the text such as (Bloggs 2011). The list of references at the end are then presented and arranged in alphabetical order by author. If there are multiple references for the same author these are presented in chronological order.
- See the following web sites for more information on the Harvard style of referencing;
  - http://www.library.uq.edu.au/help/referencing-style-guides#harvard (last accessed 08/09/2014)
  - http://www.cs.bham.ac.uk/~pxc/refs/index.html (last accessed 08/09/2014).
- Microsoft Word and Latex have their own referencing tools built into them. For a description/tutorial of how to cite using Microsoft Word see:
  - http://office.microsoft.com/en-us/word-help/create-a-bibliography-HA010067492.aspx (last accessed 08/09/2014).