How to write a research paper

The osmosis approach…..

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How to Read a Research Paper

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What is in a typical paper

- Abstract
- Introduction
- Motivation, problem description
- Research questions that are being addressed by this paper
- Experiment Setup
- Results
- Conclusions and Future work

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Why do you read a paper?

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- Purpose of reading: To understand and learn new contributions.
- However
  - 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:
  1. Breadth
  2. Depth
  3. React

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How to Read a Research Paper

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- Don't read the paper!!!!!!!!!
- Ask yourself, what is this paper about? (breadth)
  - Read the title and the abstract
    If you still don't know what this paper is about, then this is a bad paper.
  - Read the conclusion
    Are you now sure you know what this paper is about? If not it is a BAD paper. We will try not to read such papers in this course
- Read the introduction
- Read the section headings
- Read tables and graphs and captions. See what they say
- GET AN OVERVIEW OF THE PAPER.

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How to read a paper (cont)

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- See who wrote it, where it was published, when was it written (credibility)
- Skim bibliography to see if the authors are aware of relevant related work. See if you know the relevant work.
- See if you know any relevant work that they didn't refer to.
- Helps you build a picture of the community.

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How to read a paper - depth

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- Approach with scientific skepticism
- Examine the assumptions
  - Do their results rely on any assumptions about trends in environments?
  - Are these assumptions reasonable?
    - E.g. "Lets assume that there are billions of powerful computers, connected by a high speed network, spread across the world, our system will …"
    - E.g. "Our system can enable you to run Windows 98 on a 33Mhz Intel 386 with 640K main memory"

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How to read a paper - depth

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- Examine the methods:
  - Did they measure what they claim?
  - Can they explain what they observed?
    - It is easy to dump your experimental results on the paper. As a reader you want an analysis of why the system behaves a certain way, not the raw data.
  - Did they have adequate controls [reproducibility]
  - Were tests carried out in a standard way? Were the performance metrics standard? If not, do they explain their metrics clearly?

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How to read a paper - depth

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- Examine the statistics: (there is truth, lies and then there is statistics!!)
  - Were appropriate statistical tests applied properly?
  - Did they do proper error analysis?
  - Are the results statistically significant?
    - Common mistake: "We performed our experiment once at 4 am and noticed a ten fold improvement. Thus we conclude that our system is better"
  - Be very careful with percentages
    - Method A: 0.01 seconds, our Method: 0.005 seconds
    - Our method shows 100% improvement over method A!!
  - Same tenets apply to formal methods, new programming languages, new operating systems, etc…..

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How to read a paper - depth

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- Examine the conclusions:
  - Do the conclusions follow logically from the conclusions/observations/didactic
    - We performed our experiments with 8 palm pilots and saw a 10 fold improvement. Hence we conclude that our system will scale to millions of palm pilots.
  - What other explanations are there for the observed effects
  -
  - What other conclusions or correlations are there in the data that they did not point out
    - Earlier work performed experiments using a 2 Mbit wireless network. Our system (incidentally) used a 11 Mbit network and saw a 5 fold improvement. So our technique works!!

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How to read a paper - react

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- Take notes
- Highlight major points
- React to the points in the paper
  - Place this work with your own experience
  - If you doubt a statement, note your objection
  - If you find a pleasing quotation, write it down
- Construct your own example
- Summarize what you read

- Maintain your own bibliography of all papers that you ever read

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How to write a paper…?

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- GUESS.

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The 10 commandments

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1. **Thou shalt know thy target.**
2. **Thou shalt read some papers from that target.**
3. **Thou shalt do some background reading, think hard, and speak with as many people as you can in the department.**
4. **Thou shalt have a clear research question.**
5. **Thou shalt tell us what the bloody question is.**
6. **Thou shalt do real research.**
7. **Thou shalt make an argument.**
8. **Thou shalt write well.**
9. **Thou shalt be credible.[reference other people]**
10. **Thou shalt put it away for a week and come back and read it.**

Good links [places I plagiarised]

- http://alpha.furman.edu/~moakes/Powerwrite/writingtoc.htm
- http://www.eg.bucknell.edu/~cs475/F97-S98/handbook/research-paper.html
- http://www.cse.fau.edu/~dan/researchmethod/
- Fowlers modern English usage
- Oxford English Dictionary