

DD2434 Machine Learning, Advanced Course

Lecture 13: The Structure of a Scientific Paper

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By the time you finish elementary school you know a little:





Imagine a circle that contains all of human knowledge:





By the time you finish high school, you know a bit more:





With a bachelor's degree, you gain a specialty:





A master's degree deepens that specialty:





Reading research papers takes you to the edge of human knowledge:





Once at the boundary, you focus:





You push the boundary for a few years:





Until one day, the boundary gives way:





And that dent you've made is called a Ph.D.:





Of course, the world looks different to you now:





So, don't forget the bigger picture:





@mattmight, The illustrated guide to a Ph.D.

Joke - but exactly on the point

Research is about expanding the knowledge in the world

Discuss with your neighbor (5 mins): In order for a research paper to expand the knowledge in the world, what qualities should that paper have?

- Pose relevant question,
- Build upon and refer to previous work of others,
- Propose a scientifically principled method,
- Perform experiments that test the method in a principled manner and compare to a relevant baseline,
- Draw conclusions from the experiments,
- Be clear and complete so that a reader can reimplement the method and get the same results

You can use the same principles for lab reports, master thesis etc!

The peer review system

Basic scientific principle:

- Researchers review each others' work,
- Anonymous review (either single-blind, anonymous reviewers, or double-blind, anonymous reviewers and anonymous authors)



Today

The structure of a paper (Allen)

A good example (Duvenaud et al.)



The Structure of a Paper

Allen





Body

Method description – describe the approach to solving the problem presented in the intro

If experimental paper: experiment description – describe the experiments performed to test how well the suggested method performs If theoretical paper: proofs and mathematical reasoning that support the claims and to show the correctness of the method

Repeatability – should be able to re-implement the method and repeat the experiments and get the same results, using the information in the paper (including the cited references)

Referencing – for every non-trivial statement, either provide justification/ proof/experiment that supports the claim, or cite another source (with citation to a specific paper)



Introduction

Background information – why is the presented work relevant? What is the research question?

Related work (possibly in its own section) – Who has tried this before? What have they done, what aspects were they able to solve and what is still left unsolved?

What is the differences between the present work and the previous work?

Proper referencing – should clearly state what was done by others (with citation to a specific paper) and what is a novel contribution of this paper



Conclusions

Discuss the findings from the experiments and draw logical conclusions

Describe the new pieces of knowledge that were found, the "bubble" in the comic

Give recommendations for future work that should be done to cover the "holes" that are still left in the "web of knowledge" even after the present study



A Good Example

Duvenaud et al.

[Paper in pdf]

(KTH)





What is next?

Continue with Assignment 2, deadline December 16.

Paper assignments for project groups are now published, deadline **January 18**.

Next on the schedule

Tue 8 Dec 12:00-13:00 Room 1448 Lindstedtsv 3 floor 4 Q&A Jens Lagergren

Tue 15 Dec 10:15-12:00 K2 Exercise 6: Gibbs Sampling examples Hedvig Kjellström