

DKE Project 1.2 (2019-20)

Guidelines Report

This document is a guideline for first year bachelor students when writing their final report about Project 1.2.

Overall Structure

Overall, a report should be structured in different layers. This is important so that people with different interests and different roles, can easily access what is the relevant information for them. For instance, a manager may be just interested in having an overall idea about the project and the main findings, and therefore they will focus mainly on the abstract, introduction and the conclusions. On the other hand, a mathematician or computer scientist may be interested in reproducing the results reported by the authors, and therefore they will read more deeply into the content of the report. This second example also highlights another important element of a report, which links to the idea of reproducibility. The level of details in a report should be such that all experiments and results should be reproducible solely based on the content of the report, with no inputs from the authors.

The suggestions here are not hard-and-fast rules, and for many scientific reports a slightly different structure is used. (For example, in a mathematical paper, there may be no “Methods” and “Results” sections, and the main Theorems would go in a “Results” section.) Nevertheless, the sections “Introduction”, “Methods”, “Results” and “Conclusions” are standard (possibly renamed).

You must be clear about what is work original to the project, and what is already known. Usually, the cleanest way to do this is to report existing knowledge in a separate section to your own work.

The length of the report should be appropriate for the work you are presenting. It should be complete, clear and concise. However, we recommend that your report is at most 16 pages of A4 in 11pt text, excluding figures and tables. Extra material may go in the appendix.

Formulae

You should use the proper facilities for typesetting mathematical formulae (i.e. the equation editor in a word processor, or LaTeX maths mode). Write the equations yourselves, make sure that the notation is consistent with the report text, and that all symbols are properly defined. **Do not use screenshots or other graphics formats!!** Use standard symbols for quantities e.g. v for velocity, and avoid full words like `velocity_of_ball` (which might appear in the code). Do not use `*` for multiplication, but use `'x'` instead.

Figures

You should aim to draw any figures you use yourselves using the facilities provided by your document preparation system. They should be large enough that the graphical material is clear and all text is readable. Figures from external sources should only be used if they are too complicated to reasonably draw yourselves. Make sure that any labels used on the figures match those given in the text!

Photographs and drawings from external sources can be used as appropriate. All figures and images taken from external sources *must* be referenced.

Abstract

The abstract is the “shop window” of the report. It should provide the reader with a concise overview of its content and enable them to make an informed decision about whether they want to read the whole report. It should address the following points:

- Motivation (Why is it studied?)
- Problem Statement (What is studied?)
- Approach (How is it studied?)
- Main Result(s) (What is the main outcome of the study?)
- Conclusions (What are the implications of the study?)

Introduction

In the Introduction you need to explain and establish the context of your study, and the reasons for undertaking it. What is the primary question you are trying to answer? Why is this question relevant for the scientific field?

Moreover, it is important to mention what has already been done (the state-of-the-art), in order to point out the limitations of the current approaches, and establish the starting point of your research (you should avoid to re-invent the wheel). In this respect, also mention what are the main approaches or algorithms which have been proposed (also provide citations for those), and eventually, which among those you decided to focus on as starting point for your research (motivating your choice).

Next, briefly explain the main idea underlying the approach(es) you propose in your report, and explicitly state what are the novelty factors, if any.

Finally, briefly describe the structure of the report: what the reader can find in the different sections. This is important because of the multi-layer structure mentioned above.

The introduction should be easy-to-read and avoid highly technical material; this is better placed in the “Preliminaries” and “Methods” sections.

Preliminaries

In this section, you can provide more detailed and technical background material, such as notation, terminology, precise research questions and tasks, and existing theorems and results. You can also put existing methods here (though these could also be in the Methods section).

Methods

This is the section in which you should describe your approach at a sufficient level of details, in such a way that a reader could replicate the research you have done. To achieve so, you need to describe clearly how you carried out your project step by step. First, provide a description of all the algorithms

that have been used. You need to include all relevant information to allow a reader follow what you have done, at the same time referring to the original works for all details that are not relevant. Make a clear distinction between existing methods and new methods you have developed in the project. Second, you should also provide a description of the data that have been used in your project, their main properties, and why those data are suitable to answer the research question.

If you have mathematical lemmas/theorems that are relevant to your report, then these can also be placed in this section. If these lemmas/theorems are not your own work, you should cite the original source. If they are your own, then you should give a proof. (This does not mean that every project report needs to contain proofs. It depends very much on the work you have done. Also in academia articles vary considerably in the balance they strike between experiments, algorithms and mathematical theory).

Implementation

In this section, provide information about the software implementation of the methods. You do not have to provide a complete description or user documentation, but should instead describe the basic structure of the implementation, any external API, and any innovative data structures or other software engineering techniques. You should use UML diagrams and pseudocode as appropriate.

This section could be a subsection of the Methods section, especially if it is short.

Experiments

This section provides a complete and exhaustive description of all experiments/analyses/simulations you have performed in order to test or compare algorithm performance. Experiments should be reported in a logical sequence. It is important to motivate why those experiments have been chosen, and how they will help to answer the research question.

The level of details and information provided in this section should be such that a reader could reproduce all experiments without any inputs from the authors of the report, and without having to refer to any external source.

Results

This section has the purpose to present the results of all analyses/simulations/experiments described in the previous section “Experiments”, without interpretation. Results should be reported as clearly and concisely as possible, to be effective. This can also be achieved by using tables or figures. Remember to give each figure or table a title and describe in words what the figure demonstrates. If there is sufficient room, the content of the figure/table can be described in a caption underneath or to the side of it. Save your interpretation of the results for the Discussion section.

In case you have many different algorithms, it may be an option to interleave algorithms with results and have then a comparison section in the Results section.

Discussion

This section has the purpose of bringing everything together. Results are interpreted and they are used to answer the research question(s). It is discussed not only what the results show, but also why

they show this, using evidence from previous studies as well to back up your explanation. You should also mention how your findings advance the state of the art (what are the novelty factors), and also whether somehow they disagree with what previously found by other researchers, and why this may have happened.

This is also the place to mention if there were any issue (for instance, if your results were different from expectations) and how those issues were or could have been solved. Also, report any limitation of your study, which should be eventually addressed in future studies.

Conclusions

This section provide a summary of your study. The main research question is recalled concisely, and explicitly answered. No new arguments or evidence should appear in this section. Moreover, it could include recommendation on how the findings or the approach suggested in your study should be used, and some suggestions for further research.

References

List of references used in your study. There are different conventions for references, but the main thing is to be consistent. Also, you should be critical about the sources you use. In academia articles appearing in journals and conferences are considered the gold-standard. Citing academic books is also fine. You can cite websites, blogs, lecture notes etc. but you should do this sparingly and *only* if you cannot find a more academically reliable source. (The main reason we consider journals, conferences and books as more trustworthy is that they are usually peer-reviewed i.e. other scientists have critically and carefully checked their content. Also, their content is fixed, so what you refer to is what the reader will find.)

There are some exceptions to these guidelines: Websites of companies or software packages are often appropriate references, and blogs are appropriate to refer to for a personal opinion.

If you refer to information on a website which is subject to change, you should at least give the date on which the content, and may wish to cite the material in-text.

If you use e.g. Wikipedia to find information, you should follow the references provided there and cite these.

Appendices

The appendices contain any additional material or information that may help the reader, but is not essential to follow the report, and fully understand its content and main findings. This may include: raw data, (pseudo)-code, additional result tables or figures, etc. Label all appendices and refer to them where appropriate in the main text (e.g. 'See Appendix A for ...').