My DAT500 Project Report

My project subtitle

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ABSTRACT

This document serves both as a template and a guideline for your report. You can replace headings and body text with your content. Before you start writing, however, we recommend that you carefully consider the instructions in this document.

The abstract describes in concise words what you do, why you do it (not necessarily in this order), and the main result. The abstract has to be self-contained and readable for a person in the general area. We suggest to write the abstract first, as a means to guide the work, but it should be updated continuously.

In this paper we show how we used data from IMDB(source) to generate a movie cast based on user input. To determine the recommended cast we calculate a score based on genres, actor to actor relationship, and a brief movie summary. The user is presented with a list of actors and the predicted box-office value.

KEYWORDS

Report writing, Latex tips

1 INTRODUCTION

The introduction is different from the abstract; it should elaborate more on the context of the work and other aspects. Generally, you can repeat some of the main points also in the introduction, but expand and use different words.

To make your report easier to read, we recommend that you write in first person, plural, i.e. write *we*, even if the report is single author. This is also to represent that, even though you are writing this on your own, your supervisor and possibly others are contributing ideas, suggestions and corrections on your report.

What follows is a possible structure of the introduction. Note that the structure can be modified, but the content should be the same. Introduction and Abstract should fill at most the first page.

Context and Motivation. The first few sentences in the introduction is typically a brief description providing context for your work, explaining the broader domain of the work. This context should lead into the motivation for the work by identifying one or more problems.

Here is an example from [1]:

Traditional desktop applications, such as word processing, email, and photo management are increasingly moving to server-based deployments. However, moving applications to the cloud can reduce availability because Internet path availability averages only two-nines [7]. If a user's application state is isolated on a single server, the availability for that user is limited by the path availability between the user's desktop and that server. Hence, to improve availability, application state must be replicated across multiple servers placed in geographically distributed data centers.

Research Problem. This paragraph further restricts the problem introduced in the motivation to the problem you are addressing. Make sure to explain to the reader what you are doing, why it is important, and why it is non-trivial.

Related Work. Next, you have to give a brief overview of related work. For a paper like this, anywhere between 2 and 8 references. Briefly explain what they do. End the paragraph by contrasting their work to what you do, to make it precisely clear what your contribution is.

Contribution Summary. It can be a good idea to end the introduction with a summary of your contributions as bullet points. For example:

- We implement Paxos using brand new technologies.
- We evaluate our implementation both in a WAN and LAN environment and show that it is 1.0001× faster than state of the art.

It is not necessary to have a paragraph at the end of the introduction, that lists the following sections.

2 BACKGROUND

Give a short, self-contained summary of necessary background information.

For our example if your project is a new Paxos implementation, the background would be a brief introduction to the consensus problem, the Paxos algorithm, the system model used by the Paxos algorithm and common optimizations and relevant variations of that algorithm.

The goal of the background section is to make the paper self-contained for an audience as large as possible. As in every section you start with a very brief overview of the section. For our example that would be: In this section, we introduce the consensus problem, the Paxos algorithm and common optimizations of that algorithm.

If you copy a definition from a text book or some other source, you must cite that source. See Example 8.1 below.

3 RELATED WORK

Brief description of related work. Either on the same data set or similar type of program.

4 HADOOP CLUSTER

Text explaining our hadoop cluster, installation, spark...

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2020.

Our Hadoop cluster consists of one name node and three slave nodes. The name node has 8 GB RAM and a 2.4 GHz Intel Skylake processor with 4 cores. The three slave nodes have 4 GB RAM each and a 2.4 GHz Intel Skylake processor with 2 cores.

5 YOUR METHOD

Now comes the "beef" of the paper, where you explain what you did. Again, organize it in paragraphs with titles. As in every section you start with a very brief overview of the section.

This section may vary significantly depending on your topic. You may also choose to make the different parts individual sections. Here is a more general structure:

5.1 Design

Concisely present your design. Focus on novel aspects, but avoid implementation details. Use pseudo-code and figures to better explain your design, but also present and explain these in the text. To assist in evaluating your design choices, it may be relevant to describe several distinct *design alternatives* that can later be compared.

5.2 Analysis

Argue for the correctness of your design and why you expect it to perform better than previous work. If applicable, mention how your design relates to theoretical bounds.

5.3 Optimization

Explain how you optimized your design and adjusted it to specific situations. Generally, as important as the final results is to show that you took a structured, organized approach to the optimization and that you explain why you did what you did. Be careful to argue, why your optimization does not break the correctness of your design, established above. It is often a good strategy to explain a design or protocol in stepwise refinements, so as to more easily convince the reader of its correctness.

5.4 Implementation

It is not necessary to "explain" your code. However, in some cases it may be relevant to highlight additional contributions given by your implementation. Examples for such contributions are:

- *Abstractions and modules*: If your implementation is nicely separated into interacting modules with separated responsibilities you could explain this structure, and why it is good/better than some other alternative structure.
- *Optimization*: If you spend significant time optimizing your code, e.g. using profiling tools, the result of such optimization may be presented as a contribution. In this case, reason, why the optimized code works better.
- *Evaluation framework*: If you implemented a framework or application to evaluate your implementation against existing work, or in a specific scenario, this framework may be presented as a contribution.

Make sure to cite all external resources used.

6 EXPERIMENTAL EVALUATION

Here you evaluate your work using experiments. You start again with a very short summary of the section. The typical structure follows.

6.1 Experimental setup

Specify the context and setup of your experiments. This includes e.g. what hardware (VMs) you are running on, what operating system these machines are running, how they are connected, ...

Also explain how you generate load for your system and what parameters you used here. The general idea is to include enough information for others to reproduce your experiments. To that end, you should provide a detailed set of instructions for repeating your experiments. These instructions should not be included in the report, but should be provided as part of the source code repository on GitHub, typically as the `README.md` file, or as Shell scripts or Ansible scripts.

If your experiments give strange or unexpected results, analyze, profile and debug your code. **Do not simply re-run experiments until they give the expected results.**

Finally, running experiments is very time consuming and you may need to go through multiple rounds of experiment, debugging and optimization. **Do not delay running experiments until the end of your project period.**

6.2 Results

The results of your experiments. Compare different variants of your design (e.g. with and without optimizations) or compare performance to other designs or systems. Plots should show the average over multiple runs (at least 10 as a rule of thumb), including error bars, percentiles or min/max values.

Discuss the plot and extract the overall performance. Do not repeat all numbers in the text, but mention relevant differences in numbers, e.g. our optimization improves throughput by 26%. Discuss how the results validate or contradict your assumptions.

Perform experiments to evaluate your system under operating normal conditions, when experiencing failures or attacks, or with different workloads.

Figure 1 shows a graph generated with `pgfplots` from experiment data.

7 CONCLUSION

Here you need to summarize what you did and why this is important. Do not take the abstract and put it in the past tense. Remember, now the reader has (hopefully) read the paper, so it is a very different situation from the abstract. Try to highlight important results and say the things you really want to get across such as high-level statements (e.g., we believe that .... is the right approach to .... Even though we only considered LAN, the .... technique should be applicable ....) You can also formulate next steps if you want. Be brief.

8 CITATION

It is important that you correctly refer to sources.

- If you describe background, according to some textbook, cite that textbook. *See Example 8.1 below.*

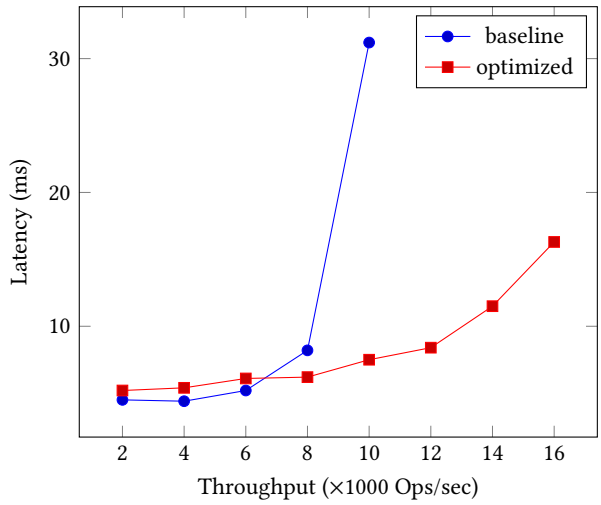

Figure 1: A graph showing latency and throughput of a baseline and optimized implementation. The axes show latency in milliseconds, and throughput in thousand operations per second. Data is made up.

- If you make a claim about trends in industry or research, add citations to validate the claim. *See Example 8.2 below.*
- **Do not copy paste text from any source into your report without citation. It will be considered plagiarism.**
- Always use the tilde character between the text and the cite command, e.g.:

  `DBLP~\cite{dplg}`

  The tilde inserts a space, but prevents line break between the text and citation.
- For correct citations we recommend that you export bibtex entries from DBLP [5]. But make sure to update the bibtex entries to adhere to the following rules.

Here are some rules to be followed for your bibliography:

- Make sure titles are correctly capitalized.
- Make sure there is enough info for a reader to find the document: authors plus title isn't enough.
- Don't blindly copy and paste ACM bibtex entries without fixing them:
  - they list "New York, NY" as the address field, which means that all ACM conferences look like they took place there; just delete this, or - better
  - replace it with where the conference took place, which is much more helpful to the reader than the publisher's address
  - they have a truly weird idea about how to capitalize conference names; just correct this (consistently)
  * IEEE is equally bad, and uses a partially-inverted form of conference names.
  * Please actually review the bibliography before submitting your paper!

And while you are at it, please:

- Add includemathpmtc in the main LaTeX file, so you don't have math stuff in a different font than the main text.
- Always use the tilde character between the number and unit, e.g. 100 Mbps or 53 ms. The tilde inserts a space, but prevents line break between the number and unit.
- Never put SI units in italics.
- Do differentiate between bits (b) and bytes (B), and between powers of 10 (MB) and 2 (MiB).
- Avoid things like: "We refer the reader to [42]." That is, don't use citations as nouns.

Example 8.1. Consensus is a distributed programming abstraction that fulfills the following properties [3]:

Termination
Validity
Integrity
Agreement

Example 8.2. Consensus systems build a fundamental part of todays cloud-computing infrastructure [2, 4, 6, 8].

9 LATEX

This section contains some instructions and examples for using LaTeX.

9.1 You can add subsections

You can use numbered subsections to structure your sections or `\paragraph` to separate paragraphs with a heading using only a few words, as used in Section 1.

(1) This is an item in an enumeration.
   - This is an item of a unnumbered list. In this case, the lists are nested within each other.

(2) The second point in the enumerated list.

I can refer to the element of the enumeration above as Point 1. If you refer to numbered items, e.g. items from a list or figures or sections, always capitalize the name. For example, this is Section 9.

9.2 Figures

You can include figures. You can include files, as done in Figure 2. Avoid including jpeg, gif or bmp files since these do not scale nicely. Again Figure 2 is an example for that.

You can create graphs from your experiment-data using `pgfplots`. See the example in `tex/evaluation.tex` and documentation http://pgfplots.sourceforge.net/pgfplots.pdf.

9.3 Other tips

- Always use the tilde character between the number and unit, e.g. 100 Mbps or 53 ms. The tilde inserts a space, but prevents line break between the number and unit.
- Never put SI units in italics.
- Do differentiate between bits (b) and bytes (B), and between powers of 10 (MB) and 2 (MiB).
- Avoid things like: "We refer the reader to [42]." That is, don't use citations as nouns.

For further instructions on how to add **Tables, Algorithms, Theorems see acmguide.pdf**.

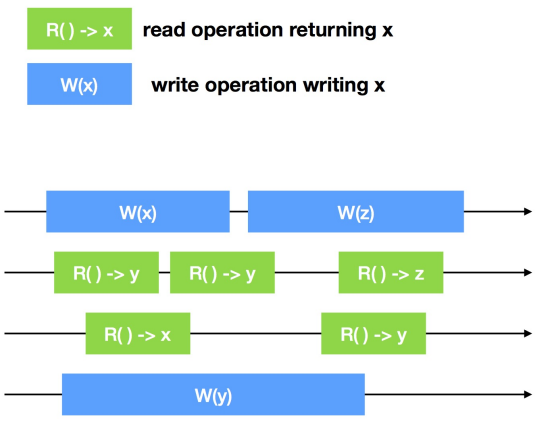

Figure 2: Figure taken from [9]

10 FURTHER READING

Here are some other useful resources: (make these into references instead of links?)

- The co-chairs of the Ninth SOSP prepared some recommendations and valuable lessons in a paper titled *How (and How Not) to Write a Good Systems Paper* https://www.usenix.org/legacy/publications/library/proceedings/dsl97/good_paper.html
- http://gramoli.redbellyblockchain.io/web/doc/talks/researchmethod.pdf
- https://www.doc.ic.ac.uk/~prp/doc/talks/11-prp-paper_writing.pdf
- This template is inspired by a template from Markus Püschel [10].

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