

L41: Lab Reports

Lent Term 2015

The purpose of a *laboratory report*, or *lab report*, is to document an experiment, its results, and its interpretation. The exact contents and format of a lab report vary by discipline but the principle is common across both the hard and social sciences: begin by describing the motivations and starting assumptions of the experiment (which will frame later design decisions), the goal of the experiment (e.g., hypothesis), describe the experimental setup itself, explore the results and their interpretation (including potential sources of error), draw any conclusions, and compare the work with pertinent related work in the field. Computer science, and especially systems research, adopts many of these elements in its writing style, although not always overtly in the format of a lab report. We will employ the genre of the lab report in L41 to help impose structure on our experimental work, and also as the primary means of assessment.

You will write three lab reports as part of the course: one ‘practice run’ derived from tracing exercises in the first submodule, and two assessed reports (weighted at 50% each) describing process and networking experiments from the two remaining submodules. The ‘practice run’ is intended to help you develop and get feedback on your report writing style so that assessment of later reports can focus primarily on experimental setup, data analysis, and conclusions. As the lab reports are the primary form of assessment for the module, it is important that you invest a significant amount of time in writing and refining the report, paying attention to detail and presentation. This is especially true for the ‘practice run’, which is your opportunity to correct errors and omissions in your approach without an impact on your final mark.

Contents

For the purposes of L41, we require that lab reports (moderately) faithfully follow this structure:

Title page Experiment name; author name; date. A 1-paragraph abstract will provide a succinct summary of the report including the nature of the experiment and conclusions that have been drawn. (1 page)

Introduction Frames the lab report as well as provides its context and motivations. (1–2 paragraphs)

Experimental setup and methodology An exploration of the goals, hypotheses, experimental setup (including platform details), procedure used in the experiment, and details of any steps taken to mitigate potential error or problems; a figure may be appropriate. (1–2 page including figures)

Results and discussion The results obtained, graphs illustrating those results, and an exploration and interpretation of the results including important artefacts, validity of the results, and conclusions they lead us to. Tables and figures required to explain the results should be present in all reports; in most cases, performance graphs will be expected, but in some cases, it may also be suitable to include state-machine diagrams. This is the body of the report. (3–4 pages including figures)

Conclusion A summation of the results and thoughts on potential future directions. (1–2 paragraphs)

References For our purposes, references to material that contextualises the work, as well as to pertinent readings we have done and a brief literature review; outside of this course, we would also expect consideration of relevant experiments performed by others in the past, along with a summary of differences in methodology and conclusions.

Appendices Additional material that supplements prior sections – e.g., it might be desirable, in explaining material in the body, to reference content such as scripts to perform experiments, additional data tables, or more detailed illustrations of an experimental setup.

Lab reports will typically be 5-10 pages including figures but excluding appendices. Appendices should be included only where they improve understanding of the body of the report – simple DTrace scripts are not appropriate to include, but should they be extended (for example) to mitigate a surprising form of measurement error, it may be appropriate to include them in an appendix that is referenced from discussion in the body.

Style and presentation

Lab reports must be clearly written, spell checked, and formatted to make them easy for the reader to follow. Given length limitations, they will of necessity be high-level presentations of our experiments, and cannot explore every detail.

Particular attention should be paid to graphs and tables that will present the results: axes must be labelled, scales should be selected with care to avoid misunderstanding, and if, for example, there are clear artefacts of interest, then an additional graph may be appropriate to explore those in greater detail. All graphs must be described in the body of the text, and also have a suitable (but brief) caption. In general, it will be important to include error bars or other error information, and explain when confidence intervals have been used.

LaTeX will be used, ideally using the **article** document class and 10pt times font; use of the course template for lab reports is recommended, but not required. The precise graphing package is up to you; all graphs must be vector-based rather than raster images, and must be prepared such that they are clear even if printed in black and white. It may be appropriate to use diagramming packages such as **tikz**, code rendering via the **listings** package, and additional tools such as **R** and **graphviz** to analyse and present results.

Students are cautioned that many of these tools are complex and subtle, and when used incautiously have a tendency to consume all available time. If you run into difficulties, seek help from the course instructor or one of the teaching assistants – and when in doubt, avoid exciting-sounding features in LaTeX!

Assessment

The following rough marking scheme will apply:

- < 60% Below the pass mark: extremely poor experimental procedure or writeup that might include an incoherent description of the work, extremely poor experimental practice that leads to incorrect results, failure to contextualise the experimental work through a consideration of error, and/or poor data analysis that draws incorrect conclusions despite clear evidence to the contrary. This marking range will also be used if there is insufficient originality; see below.
- >= 60%, < 75% Pass but below distinction: adequately performed experimental procedure and writeup, but with a few (but definitely not many) of the following problems: (1) the experimental approach will have been roughly right, but perhaps failed to take into account potential sources of error, used inadequate runs to manage variance, or failed to pursue an important behaviour or effect; (2) the writeup will have drawn reasonable conclusions about the results, but may have failed to make proper use of statistics, failed to explore sources of error, or failed to investigate a surprising effect or result; or (3) graphs will present useful results but might be less clear than desirable, make poor use of axes or labelling, or disagree with the experimental analysis.
- >= 75% Pass with distinction; most or all of the following hold: a superior writing style and clarity is employed; strong experimental procedure and error analysis is exhibited, in which surprising results or artefacts are adequately illustrated via graphs and explained in the text; and strong or even new insights into performance are gained as a result of the experiment.

Collaboration

While collaborating on experimentation itself is permitted (and even encouraged), students must independently write up and submit lab reports. You will need to employ your own discretion, but a reasonable approach might have pairs of students collaborate to understand the target software, work together to develop experimental setups and scripts, and jointly run initial experiments to debug them together. Pairs might then part ways to complete the experiments, analyse the data and actual error, produce any graphs, and write up the results. Data in appendices of

reports may indeed turn out to be substantially similar between lab partners as a result of collaboration on the setup and design choices to scripts, but excessive similarity of graphs, text, and analysis may be penalised as plagiarism.