Essentials of Technical Writing

An unsorted collection of essential points to do right in authoring scientific reports

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Using material from other papers or online sources

!!This is the most important point of all!!: *every* import of wisdom must!! be credited by giving the source. This holds for word-by-word quotes (which MUST be put into quotes), for rephrased arguments, for graphics, for data. Even when you follow in your treatment a source paper/book but re-word it entirely, you MUST acknowledge the source, for instance by beginning your import of material with something like „In the account to be given below, I follow the presentation given in [XY]". Failure to cite sources is considered as violation of the code of academic conduct and will *automatically, fast and irrevocably* lead to zeroing the grade and a report to the Office of Academic Affairs.

Never state something without a justification

EVERY statement in a scientific paper must be backed up by a justification. This holds, in particular, also for the introduction. The justification can take the form of a pointer to a reference (which is why well-written introduction sections often cite many dozens of references); or your own reasoning; or a mathematical or experimental reasoning from your own working; or (dangerous) a phrase like „… it is well-known that …<claim follows>".

English grammar and style

- If you are not firmly commanding of English grammar, pass your manuscript through the hands of a proficient speaker/writer friend. Poor English leaves the reader with an impression of lack of professionality and in real life will harm the impact of your work, or worse, make the reader quit reading. When I grade reports, bad English or more than a few typos/grammar errors is penalized by some grade reduction.

- do not use colloquial short forms like „we're", „isn't" etc. Write them out: we are, is not, etc.

- avoid colloquial superlatives like „huge", „enormous" etc. If you want to emphasize impact/size/importance of something, express this in dry terms, best backed up by numerics and references, like „… this method is suitable for very large datasets (up to 10 GB, for example in [XY])…" instead of „… this method is suitable for gigantic datasets …"

Spaces before braces

I really don't know why, but an estimated half of Jacobs University technical writing beginners do not insert spaces before brackets. I often see something like „…as shown in earlier work[2]…" or „… seems a good argument(but …" . Why, oh why, do so many not

insert spaces correctly: „…as shown in earlier work [2]…“ or „… seems a good argument (but …“

Equations

Equations (regardless whether they are inline and non-numbered or set apart and numbered) are part of the text flow and must be surrounded by the appropriate interpunctuation. For instance, write

„… as can be seen in by the inequality

$$A < B, \qquad (12)$$

which demonstrates that A is always smaller than B.“

Acronyms

The full wording of any acronym that you use must be given at the first appearance of the acronym.

Math symbols

Mathematical symbols appearing in the main text must have same mathematical font as when they appear in set-apart formulas. In Latex, write N in your latex code if you want to refer to the number N in the main text! When you want to use bold font math symbols (for instance, for matrices), write $\mathbf{X}$ etc.

References list:

- use of bibtex saves you from a lot of references formatting errors

- spend much care on the reference list. It is the quality fingerprint of a technical article and is one of the first things to be inspected by professional readers and reviewers. When it is not perfectly formatted, or when it contains low-quality or irrelevant references, the reviewer will immediately have doubts about your qualification.

- use the appropriate bibitem category (article, proceedings, techreport, unpublished…)

- do not simply use the bitex records that Google Scholar offers. They are mostly incomplete and often contain errors. Grab the bibliographic information from the original version of the paper, and/or open the website of the journal / conference / institution where it actually appeared to fix the details. This is some work.

- use a homogeneous formatting for all your references (e.g. use full names for all items; or use initial + family name for all items, don’t mix the two)

- Capitalize names of Journals and Conferences (e.g. „Neural Computation“, not „Neural computation“

- when the article title contains uppercase elements - for instance acronyms - make sure that they appear in uppercase; bibtex turns everything in titles to lowercase which can be prevented by putting those parts into {}

- Study my publications webpage or the reference list in a paper published in a good journal to see how a properly formatted reference list looks and feels.

Graphics and figures

- when creating graphics, make sure you get high-quality displays in the report. Never use jpg or low-resolution pixel graphics. Thin lines should come out crystal-clear. The best thing to do is to use a graphics engine that outputs eps or pdf formats.

- Figures must be referenced from within the main text. For every figure there must be a sniplet in the text like „… see Figure 3 …“ or „… this leads to significant improvement (Figure 3)“.

- *All* symbols in a figure must be explained, either directly in the figure, or in the caption, or in the main text.

- avoid pointing to figures by „as shown in the following figure“ etc. Instead, always use numbering: "Figure 2.1 shows ...". Besides tradition, a good reason for this strategy is that journal editors are prone to shift figures around on a page or across pages, destroying references by relative location.

- axes annotations must be legible-sized fonts (not microscopic!)

Numbered items

… like figures, sections, tables, must be written in Uppercase when referred to. Example: „… as can be seen in Table 3, …“ (not: …in table 3).

Sectioning

- when you use subsections (latex: \section{}, \subsection{}, \subsubsection{}), it is standard to insert a brief overview text or motivation after \section{}, explaining what is going to happen in the section; then start the technical contents with \subsection.

Program code

- NEVER give original programming code in scientific writing. Instead, provide *pseudocode* descriptions of the algorithmic bone of your procedures (there are a number of latex packages for nice pseudocode environments), or/and specify what your program does in abstract mathematical formalism.

Some remarks on contents

- the flesh of ML is data. Do not forget to describe the data you use, best with figures, so the reader can get the feel of it. Discuss pecularities and challenges that become apparent in your data.

- the bones of ML is the learning task that you tackle. Describe it in formal terms, in particular the objective function.

- programming code is not described or repeated in scientific papers. The computational procedures are either characterized mathematically (independent of an implementation in any specific programming language), or, if execution procedures are worth documenting, by pseudocode. Latex has nice styles for pseudocode. – In professional academic writing it has become good practice to supply easily runnable code online on the author's homepage, so that readers can re-run the procedures from the article. Some journals also offer "supplementary online materials" associated with a published paper, where one can also deposit runnable code.