Typical Mistakes You Should Avoid When Writing Your Thesis – V0.1.0

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Abstract. When proofreading students' theses, some errors occur over and over again. To prevent you from making these typical mistakes (and to spare myself the need to read and mark them), this summary lists typical mistakes you should avoid. Each of the following sections describes a problem, defines a rule (black), and mostly gives good (green) or bad (red) examples.

This collection of typical mistakes does not claim to be complete. On the contrary, it will be expanded and improved over time.

1 Including Equations

> **Equations must be embedded in the text. Neither introduce them with a ':', nor let them float around on the page without any connections.**

For example, write

> In the following, let
> $$G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k \tag{1}$$
> denote the discounted, accumulated reward, also called *return*, from time t on, where $\gamma \in [0, 1]$ is the discount factor, and T is the final time step.

,

but do not write

Let γ denote the discounted, accumulated reward, also called *return*, from time t on, where $\gamma \in [0,1]$ is the discount factor, and T is the final time step:

$$G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k \tag{2}$$

,

and also not

Let γ denote the discounted, accumulated reward, also called *return*, from time t on, where $\gamma \in [0,1]$ is the discount factor, and T is the final time step.

$$G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k \tag{3}$$

.

Your formula must be part of the sentence, which means you must use correct punctuation. If the sentence ends with your formula, do so. If you need to set a comma, then write a comma. A good example is

The discounted, accumulated reward, also called *return*, from time t on, is given by

$$G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k, \tag{4}$$

,

where $\gamma \in [0,1]$ is the discount factor, and T is the final time step.

or (assuming γ and T have already been introduced)

We define the discounted, accumulated reward, also called *return*, from time t on as

$$G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k. \tag{5}$$

.

2   Using Citations as Nouns (or Other Words)

> **A citation is not a word. You must not use it in a sentence.**

Do not write

> . . . the state value function as introduced in [4].
> [4] defines the state value function . . .

,

but use the reference either without a special mention

> . . . the state value function [4].

,

or refer to the authors' names

> . . . the state value function as introduced by Sutton and Barto [4].

.

3   How to use \cite in LaTeX

> **Use** text~\cite{sutton2018reinforcement}
> **but neither** text\cite{sutton2018reinforcement}
> **nor** text \cite{sutton2018reinforcement}.

The correct version text~\cite{sutton2018reinforcement} results in a version with an unbreakable and unshrinkable space between the text and the citation:

> text [4]

The version without space text\cite{sutton2018reinforcement} looks awful:

> text[4]

And the version with the "normal" space `text \cite{sutton2018reinforcement}` is open to mistakes. For example, it could results in an unwanted line break:
`this are many, many, and many words that should`
`cause a line break \cite{sutton2018reinforcement}`

> this are many, many, and few more words that should cause a line break [4]

Another example (assuming `\rt` is a defined command for the word 'Racetrack'), where the space vanishes: `\rt \cite{sutton2018reinforcement}`

> Racetrack[4]

4   Upper- and Lowercase Within a Sentence

> **Do not use capital letters only because you want to emphasize the meaning of a word or because it is an already defined construct.**

There are only few exceptions for writing capital letters mid-sentence. One is when writing names, e.g.,

> Markov

.

Students tend to use capital letters for important words, e.g.,

> Markov Decision Process

,

instead of Markov decision process. In general, it is incorrect to use a capital letter, "only" because the expression seems to be important.

If you want to emphasize the importance of an expression, rather use `\emph{}` (or a similar notion) when the word occurs for the first time, and write it normally ever after.

The following is a good example:

... define a *Markov decision process.* ... A great example for a Markov decision process is ...

5 Upper- and Lowercase After Colons

A colon is used to introduce something that is strongly related, such as a list of particulars, an amplification, or an conclusion. The style guides agree that, therefore, one should generally use the lowercase letter after the colon.
Exceptions are names, etc., that would also be spelled with a capital letter mid-sentence. Some of the style guides propose to also use a capital letter after a colon when what follows is a complete sentence. However, some other style guides contradict to proceed in such way and, also, it makes it way more difficult to decide when to use the lower- or the uppercase. Thus, our ruling is:

Generally use the lowercase after a colon. The only exceptions are names and other words that would also be spelled with a capital letter mid-sentence.

Do not write

... how the agent performs in unknown situations: If it was able to generalize ...
... three languages: english, german, and french.

,

but

... how the agent performs in unknown situations: if it was able to generalize ...
... three languages: English, German, and French.

.

6 upper- And lowercase In headings

Always use titlecase.com to check all headings.

There are strict rules when to use a capital letter in headings and when not. A mistake here – especially in the title of your thesis – will certainly be recognized. Fortunately, there is an easy solution: titlecase.com can be used to check which letter should be capitalized.
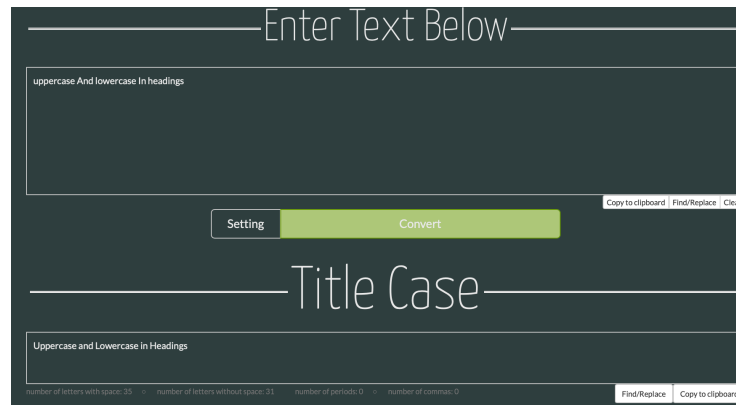

Fig. 1: Screenshot of the titlecase.com Website.

7   How to Use Figures

Never display figures without referring to/using them.

Figures that you do not use within your text are simply a waste of space. Exactly describe, what you want the reader to see/to learn from the figure. Do not babble unnecessarily about the figure, but in every case refer to it.

See section 6. (Figure 1 is without mention, without usage.)

To fix this bad sample, simply add these two sentences at the end of section 6:

Consider Figure 1, which depicts a screenshot of the website. You only need to enter your heading and press *Convert* to receive the heading in its correct form.

8   How to Use Latin Abbreviations

Some Latin abbreviations are commonly used in our field. However, they are often misused in students' theses. Therefore, we here examine their correct usage.

Abbreviations	Latin	Meaning
et al.	et alii, et alia, et alibi	and others
etc.	et cetera	and the others, and other things, and the rest
e.g.	exempli gratia	for example, for instance
i.e.	id est	that is, in other words

> **When a sentence ends with an abbreviation, do not set a double period, but use all other punctuation marks.**

A bad example would be

> . . . they had apples, oranges, etc.. Also, . . .

,

while it is correct to write

> . . . they had apples, oranges, etc.! Also, . . .

.

> **Both e.g. and i.e. are conjunctive adverbs. Do not use them at the beginning of a sentence.**

Conjunctive adverbs connect two sentences. Other examples are 'however', 'thus', or 'though'. The correct usage therefore is

> . . . they had a lot of fruit, e.g., apples, oranges, and bananas.
> . . . the *return*, i.e., $G_t = \sum_{k=t+1}^{T} \gamma^{k-t-1} R_k$.

.

While it is common to use other conjunctive adverbs in the beginning of a sentence, e.g.,

> However, . . .

,

it would not make any sense to do this with 'e.g.' or 'i.e.':

> . . . they had a lot of fruit. E.g., apples, oranges, and bananas . . .

Note that you cannot use 'etc.' in combination with 'e.g.' or with similar terms such as 'such that', or 'for example'.

Usually, publisher guidelines define when all author names should be spelled and when you should use 'et al.' within the text (In the bibliography, usually all authors are listed). For your thesis, I suggest the following (which is also common for must publishers): Spell out the name of one or two author(s), and use 'et al.' for three or more authors, e.g.,

Author	Spelling
Jane Doe	Doe
Jane Doe, Max Mustermann	Doe and Mustermann
Jane Doe, Max Mustermann, Jean Tout-le-monde	Doe et al.
Jane Doe, Max Mustermann, . . . , Jean Tout-le-monde	Doe et al.

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9   Introduce Abbreviations

Introduce abbreviations for the most important concepts and use them regularly. Never use an abbreviation that was not introduced.

Abbreviations make your text easier to read and understand. Lets revisit a former example that can even get better when instead writing:

> . . . define a *Markov decision process* (MDP). . . . A great example for an MDP is . . .

If you are using common constructs, e.g. Markov decision processes, make sure to use the common abbreviations (here MDP) and do not invent new ones. Only introduce new abbreviations if there are no commonly used ones in the literature. Still, do not use an abbreviation that you did not introduce, regardless how common and well-known it is.

10   Define Your Commands

One of the worst things about a thesis is inconsistency. This is not just a question of style, e.g., whether to write racetrack or Racetrack, but can further lead to the reviewers misunderstanding your thesis, e.g., if an important aspect is referred to by two different names and the reader is not aware that those names mean the same. An easy mechanism to avoid such ambiguities is to define LaTeX-commands for every important or regularly used expression.

> **Generously make use of** `\newcommand{}{}`**. Define commands for every word/expression/... you use regularly.**

Not only does this decrease the chances of inconsistencies, but it also makes changes that might be required mid-writing much easier.

11   Variable Names in Math Mode

> **When using variables that are longer than a single letter, use** `\mathit{}`**.**

In math mode, LaTeX assumes every letter to be its own variable. If we assume your variable to be named "TEST", simply writing `$TEST \cdot TEST $` results in this ugly version

$$TEST \cdot TEST$$
,

while when using `mathit`, the letters are displayed closer together, i.e., `$\mathit{TEST} \cdot \mathit{TEST}$` produces

$$TEST \cdot TEST$$
.

12   Consistency

Minor decisions in your thesis, e.g. whether to write *figure* with a lowercase, or *Figure* with an uppercase letter when referring to a Figure, are not incredibly important. However, (as already mentioned,) one of the worst things about a thesis is inconsistency. When you make a minor decision for a "style", stick to that decision throughout your thesis.

> **For each decision you make: stay consistent.**

13   Use Spell and Grammar Checkers

Even though the quality of your language does not explicitly influence the grade of your thesis, it implicitly does. First, it can be quite hard to understand what you want to express if the thesis is not written in proper English. Second, it is hard to focus on the content of your thesis when there are many language errors.

> **Whenever you send (a part of) your thesis to your supervisor or advisor, make sure that there are neither typos nor grammar issues.**

Note

So far, this paper lists very concrete mistakes and shows how to fix them. It should be easy to avoid these mistakes after reading this paper. The following sections do not describe concrete mistakes but rather give general advice for writing. You will probably need practice to follow them. However, as I still find that it is helpful information, the following *special sections* rightfully belong in this paper.

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14   Whether to Use Active or Passive Voice; Whether to Use the First Person Pronoun

This section will be shorter as it should; I could write a whole book (or at least a paper) about it. I here summarize my point of view on this complicated matter. Note, whatever this summary states holds only in our area of science - if so at all.

14.1   Active Versus Passive Voice

Ancient science tells us to favor the passive voice over the active one. However, this is no longer true - and it has not been for quite some time. Sadly, this knowledge has not emerged to (all) schools yet, where passive voice is still taught to be favorable.

> **Whenever possible, prefer the active voice over the passive one.**

Most of the style guides of journals, experts, . . . agree that the active voice is not only shorter but makes a sentence more readable. However, while you should use passive voice carefully, it is not strictly forbidden to use it. Try to keep its usage to a minimum.
Compare the active sentence

> . . . this summary lists typical mistakes you should avoid

with

> ...in this summary typical mistakes you should avoid are listed

the passive one. The active voice is not only 20% (2 words out of 10) shorter, but also easier to read. There are many examples (you can easily find references in the web), where the saving is even significantly higher.

14.2   Whether to Use the First Person Pronoun

Once again, you might be surprised: the vast majority of journals, experts, ...agree that there are no restrictions on using the first person pronoun. This includes both the singular ('I') and the plural ('we') forms, dependent on whether you are a single author or a group of authors, respectively. (As you are writing your thesis, of course, you are a single author.) However, in our field, it is uncommon to use 'I'. Therefore we conclude:

> **Make use of the first person pronoun. Stick to the plural form ('we').**

There are several examples to justify this rule. We here only want to look at a common phrase

> We conducted an experiment ...

,

which informs the reader not only about the experiment but that we did it. In comparison, the passive voice

> An experiment was conducted ...

clearly does not answer who conducted the experiment. Science should be as precise as possible. There is no reason to conceal who conducted the experiment.

14.3   Whether to Use the First Person Pronoun and the Active Voice Together

When looking at the last example, the answer is clearly yes: we were the ones to conduct the experiment, we want to share that information and, therefore, 'we' needs to be the subject of the sentence.
Still, lets revisit at another example:

> ...we summarized typical mistakes you should avoid

Is the information that we created the summary necessary to the sentence? The list of the author(s) is at top of the paper anyways, and for the concrete sentence, the information is not important at all. It is better to make the 'summary' the subject:

> . . . this summary lists typical mistakes you should avoid .

In conclusion:

> **Use the first person pronouns whenever necessary, but try to avoid it else.**

15   Editorial We

The 'editorial we' means the inclusion of a further group of people in addition to the author(s), e.g., the author(s) and the reader together, a larger group of scientists (including the author), even all scientists in general, etc. – and exactly this ambiguity constitutes a problem. Remember, science should be as precise as possible; the ambiguity introduced by the 'editorial we' represents the opposite. However, consider this example:

> . . . in Chapter 5, we examine . . .

Clearly, 'we' here is editorial: it means the author(s) and the reader. This sentence is hart to write - at least when sticking to the active voice. Therefore, our rule comes as a compromise:

> **Do not overuse the 'editorial we'. Use it only to express 'the author(s) and the reader', but never to write about other, equivocal groupings.**

The difference between 'we' representing only the author(s), and 'we' representing author(s) and reader together can be distinguished by the context of the sentence.

16   Tenses

There are several different guides that, in a very complicated and very detailed manner, explain which tense to use depending on the chapter and even on the type of content. Mostly, they do not agree with each other. This section describes the solution I have found for myself. I do neither claim that this solution is perfect nor that it is the only way to do it - I rarely describe a rough guideline which might be helpful.

16.1   Present Tense

The *present tense* is the main tense of your thesis. Use it when writing about your work, e.g., describing figures, presenting results, analyzing your findings, discussing your results, etc. A few examples are:

> As Figure 5 displays . . .
> We conclude that . . .
> . . . this leads to the conclusion . . .

Also, the present tense is used to describe things that are generally accepted in your field, or to refer to findings from other papers (both with a reference), e.g.,

> . . . DQN is more stable than NFQ [2] . . .
> . . . Gros et al. claim that the learning curve is not meaningful enough and, therefore, DSMC should be used [1].

.

16.2   Past Tense

Use the path tense, when writing about experiments you conducted *before* writing your thesis, e.g.,

> . . . we trained different agents ...
> we conducted specific experiments that . . .

.

Note that these things you describe in the past tense must be finished before you can write your thesis - in contrary to the analysis, results, etc., you describe in the present.
Also use the past tense, when writing about methodology published in former publications, e.g.,

> . . . Deep Q-learning, introduced by Mnih et al. [2], . . .
> . . . as we examined in prior work [1], . . .

,

or when writing about things that were disproved, e.g.,

> . . . the world was thought to be flat . . .

.

Lastly, use the tense when summarizing things you already wrote earlier (which usually is the case in the conclusion), e.g.,

> With this paper, we presented a long list of mistakes to avoid . . .
> . . . we showed, how the approach works by . . .

.

16.3   Future Tense

Use the future only, when writing about things not included in the paper but left open (which usually is the case in future work), e.g.,

> In the future, we will address the problem . . .
> We will continue developing . . .

.

16.4   Putting It All Together

It is hard to summarize all of this into a simple rule, but I think it comes down to this:

> **Generally use the present tense, except for describing things in the past (use the past tense) or things that will happen in the future (use the future tense).**

There is no need for overly complex tense rules.

17   Being Concise

Again, this section will be shorter as it should. There are courses and papers just about how to be concise in science. One of the oldest and best known books

about English writing describes writing concise as: "A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all sentences short or avoid all detail and treat subjects only in outline, but that every word tell." [3]
At the same time, the same book advises: "Do not take shortcuts at the cost of clarity." [3]
Our ruling joins the two advises of Strunk and White:

Try to express yourself as short and as precise as possible, but write detailed enough for readers to understand your writing.

Note, that this paper is an explanation and not a publication. In many parts, it is not concise, e.g., repeating some things, or using more words than needed to ensure clarity in a way you would not use in a publication.

Closing note: Please note that having this list of typical mistakes to avoid does not mean that I did not do (some) of these mistakes in the past or that I will never make them again in the future. However, both you and I should try to stick to these rules.

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