Dos and Don'ts for
Scientific Writing & Presenting

A beginner's guide to avoid common mistakes and
pitfalls when creating scientific works

Horst Possegger
TODO contact details

and

Peter M. Roth
TODO contact details

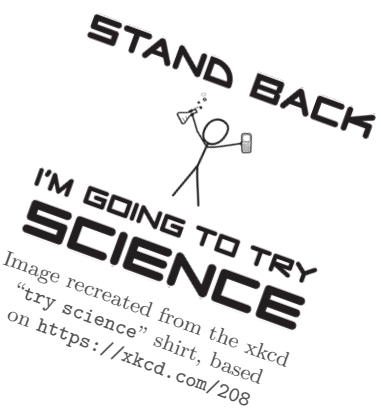
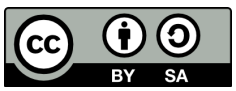


Image recreated from the xkcd "try science" shirt, based on https://xkcd.com/208

Version 1.6
Graz, October 31, 2021



Contents

1 Introduction

Scientific communication – especially writing, but also presenting – is a craft with a steep learning curve, as each and every student is about to learn. The goal of this document is to accompany students on this "climb" and provide you the basics (helpful tipps & recommendations) for writing your first scientific papers and presenting your work. These recommendations focus on the Computer Science domain, although most are universally valid for other research fields, too.

Peter and Horst taught this craft for several years to their students at Graz University of Technology. A preliminary version of this document accompanied our seminars – *"Introduction to Scientific Working"* and *"Writing Scientific Papers"* (German: *"Verfassen wissenschaftlicher Arbeiten"*) – where students learned (1) how to write scientific papers and (2) how to prepare and give a scientific presentation.

From our experience over the years, we summarized typical errors, so you can avoid them from the beginning. Thus, we include the most important **dos** and **dont's** to help you get started with scientific writing and presenting. To this end, you should be aware of:

- How to cite papers correctly (Section 2).
- What to (not) include in a bibliography (Section 3).
- Typesetting figures and tables correctly (Section 4).
- Mathematical writing (Section 5).
- Avoid plagiarism (Section 6).
- Best practices for scientific presentations (Section 7).
- General language-related advice (especially for non-native speakers) to get familiar with some specialities of scientific writing in English (Section 8).

A Note on Typesetting:

We highly recommend using LaTeX, as it simplifies layouting scientific texts a lot. This includes the generation of bibliographies, correct and consistent citation, referring to figures, tables, or equations, and, in general, ensuring a consistent layout following the requested style.

To help you get started with LaTeX, this document provides several typesetting examples. This, however, is not a step-by-step LaTeX tutorial. If you have never used LaTeX before, you may want to check out a beginner's tutorial (*e.g.* on Overleaf[1]) and refer to Q&A sites, such as the great community site on TeX – LaTeX Stack Exchange[2].

[1] Overleaf LaTeX tutorial: https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes
[2] TeX – LaTeX Stack Exchange: https://tex.stackexchange.com

2 References & Citations

Any content originating from others must be cited correctly in any document you will ever write, for several reasons:

1. To support your own arguments by bringing them into context with existing works.
2. To substantiate the credibility of your statements.
3. To allow for traceability.
4. To acknowledge their work.

However, **pay attention to the quality of your references!** There are many *predatory journals and conferences* which do not follow scientific standards (even if they claim to have *peer review*). As a **rule of thumb**, check for each reference you want to use:

1. The *journal and conference rankings* (*e.g.* Google Scholar[3], Microsoft Academic Search[4] or ArnetMiner[5]) to check whether the paper was published at a top tier journal/conference.
2. The *Journal Citation Reports (JCR) impact factor* of journals (which can be looked up at their official websites).
3. The *citation count* of the corresponding paper and the scholarly metrics (*e.g. h-index* or *i10-index*) of the author(s).

As a **warm-up exercise**, look up the rankings and metrics/impact factors for (1) the top tier computer vision & machine learning conference *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, (2) the top tier computer science journal *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, and (3) the renowned multidisciplinary journal *Nature*.

Direct Quotations:

If you ever need to copy text directly, ensure that these *direct quotations* are clearly made apparent **to avoid plagiarism**. This can be done by changing the layout to highlight the copied text passages. For example: use italicized fonts, quotation marks, and put the text in an indented block. For example, the Austrian Universitätsgesetz 2002 (UG) defines plagiarism as:

> *"Ein **Plagiat** liegt jedenfalls dann vor, wenn **Texte, Inhalte oder Ideen** übernommen und als eigene ausgegeben werden. Dies umfasst insbesondere die Aneignung und Verwendung von **Textpassagen, Theorien, Hypothesen, Erkenntnissen oder Daten** durch **direkte, paraphrasierte oder übersetzte Übernahme ohne entsprechende Kenntlichmachung** und Zitierung der Quelle und der Urheberin oder des Urhebers."* (UG §51, Z31)

Note, however, that computer science papers almost **never use direct quotations**. Instead, we use **indirect quotations**, which means that content from others (algorithms, ideas, evaluations, data, *etc.*) is only referred to or summarized in your own words. For more details, refer to the plagiarism examples in Section 6.

[3] Google Scholar rankings: https://scholar.google.com/citations?view_op=top_venues&hl=en&vq=eng
[4] Microsoft Academic Search rankings: https://academic.microsoft.com/topic/41008148
[5] ArnetMiner rankings: https://aminer.org/ranks/conf

2.1 Referencing a Paper

- Whenever you mention a method **for the first time** in a document, cite the corresponding paper. For example, "we use **SIFT [11]** features to match corresponding points between image pairs".
- **Back your statements by references** – if you say "this is well known/this has been done before", also list the relevant papers (those which have done "this" before or which have proposed "this").
- References are **part of the sentence** – thus, pay attention to correct punctuation: "**[...] poses and scales [5].**" instead of "**[...] poses and scales. [5]**".
- Similarly, **never place a reference after a paragraph**. In scientific literature, this is not a correct citation (and additionally, does not indicate that you based the information within this paragraph on the corresponding paper).
- There must be a single space between the text and the reference: "**[...] object detection␣[5]**" instead of "**[...] object detection[5]**" or "**[...] object detection␣␣[5]**".
- To cite a paper with LaTeX, you need to have a bibliography entry (will be explained in Section 3) and simply use the `\cite{}` command. To prevent unwanted line breaks, always use a *protected space* (special character '~') instead of a standard space '␣' – pay attention to the corresponding LaTeX sources of the following examples.

Guideline Example 1: Correct Citation of a Single Paper

According to Smith [15], the quick brown fox jumped over the lazy dog.
It is well known that the quick brown fox jumps over the lazy dog [15].
We apply Dijkstra's algorithm [6] to find the shortest path.

LaTeX

```
According to Smith~\cite{smith14}, the quick brown fox jumped
over the lazy dog.

It is well known that the quick brown fox jumps over the lazy
dog~\cite{smith14}.

We apply Dijkstra's algorithm~\cite{dijkstra59} to find the
shortest path.
```

Guideline Example 2: Incorrect Citation of a Single Paper

The lazy dog uses **free-floating references. [15]**

There must always be a space between text and citation, **not like this[13]**.

Pay attention not to add two spaces: in LaTeX, "`text␣~\cite{dijkstra59}`" will incorrectly produce "**text␣␣[6]**".

2.2 Referencing Multiple Papers at Once

- Sort multiple references in ascending order to improve readability. This helps your reader checking your references more efficiently.

- If you **cite multiple** papers at once, put them in a single citation – in LaTeX, you use a single `\cite{label1, label2, ...}` command.

Guideline Example 3: Correct Citation of Multiple Papers

This can be solved by [7, 13, 15].
Sorting references, such as [6, 7, 15], speeds up the reading flow.
If you talk about *much interest in/many works on* a topic, also list them, such as "this topic has been explored by many approaches, *e.g.* [6, 13, 15]".

LaTeX

```
This can be solved by~\cite{everyman14, roe17, smith14}.

Sorting references, such as~\cite{dijkstra59, everyman14, smith14},
speeds up the reading flow.

If you talk about \emph{much interest in/many works on} a topic,
also list them, such as ``this topic has been explored by many
approaches, \emph{e.g.}~\cite{dijkstra59, roe17, smith14}''.
```

Guideline Example 4: Incorrect Citation of Multiple Papers

This can be solved by **[7], [11], [15]**.
Maximize your reader's effort with unsorted references, such as **[17, 8, 42, 6, 99]**.
There are **many algorithms** to solve this problem **(But I don't list any)**.

2.3 Author Names and *et al.*

- If a paper is authored by three or more people, use *et al.* This is an abbreviation of the Latin *et alii*, meaning "and others".
- In a *presentation*, **never say "Smith *et al.*"** – either say the full Latin form "Smith *et alii*" or (even better) **say "Smith and colleagues"**.
- If you refer to the authors of a paper, only use their surnames.

Guideline Example 5: Correctly Referring to Authors

- Single author: Smith [4] proposed frobnication.
- Two authors: Roe and Doe [3] extended this approach.
- Three or more: Everyman *et al.* [2] studied frobnicating machines.

Bibliography of this Example:

[2] R. Everyman, M. Major, J. Bloggs, and J. Roe. Can a Machine Frobnicate? In *Proc. of the International Foo Filter Symposium*, 2014.

[3] J. Roe and J. Doe. The Frobnicatable Foo Filter and its Applications. In *Proc. of the Conference on Frobnication*, 2017.

[4] J. Smith. Frobnication Tutorial. *Journal of Theoretical Foo Filters*, 12(4):23–42, 2014.

Guideline Example 6: Incorrectly Referring to Authors

- "**Roe *et al.*** [3] proposed..." is wrong, because there are only two authors: "**Roe and Doe** [3] proposed..."
- "**Everyman, Major, Bloggs, and Roe** [2] showed..." is wrong, because more than two authors requires *et alii*: "**Everyman, *et al.*** [2] showed..."
- "**Everyman, Major, *et al.*** [2]" is also wrong, because we only write the first author's name when using *et alii*: "**Everyman, *et al.*** [2]".
- "**J. Smith** [4] showed..." is wrong, because we should not include the author's first name: "**Smith** [4] showed..."
- "Smith [4] **show**..." is wrong, because a single author requires the *third-person singular* form: "Smith [4] **shows**..."

Bibliography of this Example:

[2] R. Everyman, M. Major, J. Bloggs, and J. Roe. Can a Machine Frobnicate? In *Proc. of the International Foo Filter Symposium*, 2014.

[3] J. Roe and J. Doe. The Frobnicatable Foo Filter and its Applications. In *Proc. of the Conference on Frobnication*, 2017.

[4] J. Smith. Frobnication Tutorial. *Journal of Theoretical Foo Filters*, 12(4):23–42, 2014.

3 Bibliography

In this section, we first summarize general rules for bibliographies (see Section 3.1). Then, we list exemplary bibliography entries showing the **required fields for different publication types** (such as papers, books, *etc.*), along with their corresponding BibTeX entry (see Section 3.2) and provide suggestions that help you use BibTeX more efficiently (see Section 3.3). Additionally, we demonstrate how to **correctly compile a PDF with LaTeX+BibTeX** (see Section 3.4).

3.1 General Rules for Bibliographies

- **Never copy a bibliography entry** without double-checking it yourself (neither from the internet, nor from another paper's bibliography)! Unfortunately, many published papers (even from top tier conferences and high impact journals) contain sloppy and/or incorrect references. Similarly, references listed on Google Scholar, ResearchGate, *etc.* are quite often incomplete. Thus, check every reference you want to add to your paper for:
  - **Correctness** – double-check your references, *e.g.* by looking up the publication in the official conference proceedings or journal.
  - **Consistency** – use the same abbreviations, the same name/style to refer to conferences or journals.
  - **Completeness** – each reference must contain at least the following fields (more details for each publication type are provided in Section 3.2):
    - Authors
    - Title
    - Source (conference, journal, book, *etc.*)
    - Issue/volume/number (for journal articles and technical reports)
    - Page numbers (for journal articles)
    - Year of publication
- Each reference in your bibliography **must be cited at least once** within the text.
- Avoid lexicographic entries (this usually happens if you copy the name of a conference/journal from some website). For example, compare the following:
  - Authors. Title. In *Proc. of the **IEEE Conference on Computer Vision and Pattern Recognition***, 2020.
  - Authors. Title. In *Proc. of the **Computer Vision and Pattern Recognition, IEEE Conference on***, 2020.
- Similarly, remove redundant information from the conference names, such as the year of publication (as this will be stated separately, as specified by the corresponding bibliography style).
  - Authors. Title. In *Proc. of the **IEEE Intelligent Vehicles Symposium (IV)***, 2019.
  - Authors. Title. In *Proc. of the **2019 IEEE Intelligent Vehicles Symposium (IV)***, 2019.
- For well-known conferences, no ordinal numbers are needed. This information can be – if anyone is actually interested in – looked up easily online:
  - Authors. Title. In *Proc. of the **International Conference on Frobnication***, 2019.
  - Authors. Title. In *Proc. of the **23rd International Conference on Frobnication***, 2019.

- Conference proceedings are usually digital. Thus, there is no need to include volume or pages (it is also surprisingly difficult to extract this information correctly)!

3.2 Required Bibliography Fields

As mentioned above, depending on the publication type you want to cite (*e.g.* conference papers, books, *etc.*), there are different **required fields** you must provide in your bibliography. Below, you'll find examples for (almost) all publication types you'll need. For each type, we list the required fields you have to provide in your bibliography (such as `title`, `author`, *etc.*) within the corresponding exemplary BibTeX entry. Also pay special attention to the additional notes/caveats as these summarize common mistakes you should avoid.

Bibliography Example 1: Conference Paper

BibTeX entry:

```
@inproceedings{some-label,
  title     = {{A} {S}olution to {F}oo},
  author    = {Doe, John and Smith, Jack John},
  booktitle = {Proceedings of the Conference on Scientific Writing},
  year      = {2021}
}
```

Corresponding bibliography entry:

[42] J. Doe and J. J. Smith. A Solution to Foo. In *Proceedings of the Conference on Scientific Writing*, 2021.

Caveats:

- You have to **explicitly write** "*Proceedings of the*" or "*Proc. of the*" inside the `booktitle` field.
- The extra curly braces (*e.g.* `{F}oo`) within the `title` field ensure that the **capitalization** won't be changed by BibTeX.
- Conference proceedings are usually digital – there is no need to include *volume* or *pages* (it's also surprisingly difficult to get this information correctly)!
- Ensure that you write the conference names correctly ordered – if an online library uses lexicographic entries, *e.g.* a conference name similar to *"**Scientific Writing, Conference on**"*, you have to correct this as `booktitle = {Proceedings of the Conference on Scientific Writing}`.
- Ordinal numbers should not be included in the conference name, *e.g.* remove the "*23rd*" within "*23rd International Conference on Frobnication.*"

Bibliography Example 2: Journal Article

BibTeX entry:

```
@article{kalal12a,
  title   = {{T}racking-{L}earning-{D}etection},
  author  = {Kalal, Zdenek and Mikolajczyk, Krystian and
             Matas, Ji{\v{r}}{\'i}},
  journal = {IEEE Transactions on Pattern Analysis and
```

```
                Machine Intelligence},
  volume  = {34},
  number  = {7},
  pages   = {1409--1422},
  year    = {2012}
}
```

Corresponding bibliography entry:

[23] Z. Kalal, K. Mikolajczyk, and J. Matas. Tracking-Learning-Detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 34(7):1409–1422, 2012.

Caveats:

- **Always double-check** the *volume* and *number/issue* (some journals only publish *volumes*).
- Use a **hyphen** (double dash) for the page range, *i.e.* `pages = {1409--1422}`.

Bibliography Example 3: Book

BibTeX entry:

```
@book{bishop06a,
  title     = {{P}attern {R}ecognition and {M}achine {L}earning},
  author    = {Bishop, Christopher M.},
  edition   = {First},
  publisher = {Springer},
  year      = {2006}
}
```

Corresponding bibliography entry:

[48] C. M. Bishop. *Pattern Recognition and Machine Learning*. Springer, first edition, 2006.

Bibliography Example 4: Book Chapter

BibTeX entry:

```
@inbook{bishop07a,
  title     = {{B}ayesian {S}tatistics},
  chapter   = {{G}enerative or {D}iscriminative?
               {G}etting the {B}est of {B}oth {W}orlds},
  author    = {Bishop, Christopher M. and Lasserre, Julia},
  publisher = {Oxford University Press},
  pages     = {3--24},
  year      = {2007}
}
```

Corresponding bibliography entry:

[49] C. M. Bishop and J. Lasserre. *Bayesian Statistics*, chapter *Generative or Discriminative? Getting the Best of Both Worlds*, pages 3–24. Oxford University Press, 2007.

Caveats:

- Be aware that in this case the ***title* field** is the **title of the book**, whereas the ***chapter* field** is the name of the **actual contribution!**

Bibliography Example 5: Thesis

BibTeX entry:

```
@phdthesis{fearnhead98,
  title  = {{S}equential {M}onte {C}arlo methods in filter theory},
  author = {Fearnhead, Paul},
  school = {University of Oxford, Department of Statistics},
  year   = {1998}
}
```

Corresponding bibliography entry:

[99] P. Fearnhead. *Sequential Monte Carlo methods in filter theory.* PhD thesis, University of Oxford, Department of Statistics, 1998.

Caveats:

- For a master's thesis, use the BibTeX entry type `@mscthesis` instead.

Bibliography Example 6: Technical Report

BibTeX entry:

```
@techreport{nayar89,
  author = {Nayar, Shree and Nakagawa, Yasuo},
  institution = {Carnegie Mellon University},
  number = {CMU-RI-TR-89-27},
  title = {{S}hape from {F}ocus},
  year = {1989}
}
```

Corresponding bibliography entry:

[27] S. Nayar and Y. Nakagawa. *Shape from Focus.* Technical Report CMU-RI-TR-89-27, Carnegie Mellon University, 1989.

Bibliography Example 7: Papers found on arXiv

BibTeX entry:

```
@article{nam16b,
  title   = {{M}odeling and {P}ropagating {CNN}s in a {T}ree
             {S}tructure for {V}isual {T}racking},
  author  = {Nam, Hyeonseob and Baek, Mooyeol and Han, Bohyung},
  journal = {arXiv CoRR},
  volume  = {abs/1608.07242},
  year    = {2016},
  url     = {https://arxiv.org/abs/1608.07242}
}
```

Corresponding bibliography entry:

[99] H. Nam, M. Baek, and B. Han. Modeling and Propagating CNNs in a Tree Structure for Visual Tracking. *arXiv CoRR*, abs/1608.07242, 2016. URL `https://arxiv.org/abs/1608.07242`.

Caveats:

- **Double-check** (and then triple-check) **any arXiv content** – are you really sure that the paper has not been published already at a conference/journal?

Bibliography Example 8: URLs

BibTeX entry:

```
@misc{bouguet10,
  title        = {{C}amera {C}alibration {T}oolbox for {M}atlab},
  author       = {Bouguet, Jean-Yves},
  howpublished = {\url{http://www.vision.caltech.edu/bouguetj/
                  calib\_doc/index.html}},
  note         = {Online; accessed July 30, 2017},
  year         = {2010}
}
```

Corresponding bibliography entry:

[13] J.-Y. Bouguet. Camera Calibration Toolbox for Matlab. `http://www.vision.caltech.edu/bouguetj/calib_doc/index.html`, 2010. Online; accessed July 30, 2017.

Caveats:

- Use URLs in your bibliography **only if you really have to**, *e.g.* when referring to a software toolbox or framework that you used.
- It is recommended that you place URL references within footnotes (LaTeX: **\footnote{}**) instead of your bibliography.
- URLs may contain characters with special meaning to LaTeX/BibTeX, such as the underscore above. To prevent compilation errors, properly escape those characters, *e.g.* use '_' instead of a plain '_'. The same also applies for the ∼ symbol, which – when copied from URLs – would be incorrectly interpreted as protected space. Thus, you can use **$\sim$**, **\texttildelow**, or **\~{}** instead. See Section 8.3 on how to typeset special characters in LaTeX.

3.3 BibTeX Best Practices

- To ensure that BibTeX-entries are shown correctly in the bibliography some special formatting rules have to be followed:

Bibliography Example 9: BibTeX Special Formatting Rules

– Put extra curly braces within the `title` field to ensure that the capitalization won't be changed by BibTeX, *e.g.* `title = {{T}his is a {C}apitalized {F}oo}`.

– Use the corresponding LaTeX commands to typeset *diacritics* or *umlauts*, *e.g.* {\v{r}} produces ř, {\"A} produces Ä, {\'a} produces á, *etc.* See also Section 8.3 on how to typeset umlauts and diacritics in LaTeX.

– Use double dashes for the page range, *i.e.* `pages = {1409--1422}`. A single dash is reserved for compound words, *e.g.* "state-of-the-art".

- BibTeX allows several ways to list the author names of a publication. To ensure that first and surnames are always identified (and typeset) correctly, we recommend you use the following format:

Bibliography Example 10: BibTeX Author Names

```
# Always state authors as 'surname(s), first name(s)':

author = {Mallone, Molly}

author = {van Gool, Luc}

author = {Roth, Peter M. and Possegger, Horst}

author = {Ben Shitrit, Horesh and Fua, Pascal}
```

- Define BibTeX strings for conference/journal names. These are similar to constant variables or pre-processor defines and ensure that you use the corresponding conference/journal name consistently. Additionally, they simplify changing the name (*e.g.* to fix a typo):

Bibliography Example 11: BibTeX Strings

```
# First, define the name of the TPAMI journal once:
@string{TPAMI = {IEEE Transactions on Pattern Analysis
                 and Machine Intelligence}}

# Then, use it for every article published in TPAMI:
@article{
  ...
  journal = TPAMI,
  ...
}
```

- Organize the labels of your bibliography entry such that you can easily recall the papers while writing: a label like `best-practices` may be easier to recall/remember than `dos-and-donts-for-scientific-writing-and-presenting`.
  You can also add arbitrary prefixes to create your own label taxonomy:

Bibliography Example 12: BibTeX Labels

```
# Exemplary label taxonomy to structure your .bib file:
# * Common prefix 'programming' for all programming-related material:
@book{programming:knuth97, ...}

@book{programming:gamma94, ...}

# * Common prefix 'sfm' for all papers on structure-from-motion:
@inproceedings{sfm:seminal-work, ...}

@techreport{sfm:nitty-gritty, ...}
```

3.4 Compile the Bibliography with BibTeX

You need to invoke your LaTeX compiler multiple times to ensure correct cross-referencing. Assuming you use `pdflatex` (as your LaTeX compiler) and `bibtex` (as your BibTeX compiler), you need to run:

1. `pdflatex mypaper.tex`

   This first run yields a warning like "*There were undefined references*" and your PDF will contain lots of "[?]".

2. `bibtex mypaper`

   BibTeX collects all bibliography entries you referred to in your document. From now on, all references should be known (unless there were some typos) – so you need to re-compile your PDF.

3. `pdflatex mypaper.tex`

   This run yields a warning like "*References may have changed, rerun*" indicating that the page numbers of some citations may have changed (due to replacing the previous "[?]" by the correct reference).

4. `pdflatex mypaper.tex`

   Done – now you have your final PDF.

4 Figures and Tables

- Use figures and tables to **help the reader understand your work**. For example, they can provide an overview of your approach; a summary of your key findings; a comparison of different approaches/methodologies; *etc.*
- Pay attention to **correctly cite the source** of an illustration or table! Even if you just copied parts of an illustration/table, you still need to state this explicitly.
- Whenever you include illustrations or tables within your documents, you must **refer to them within the corresponding text**, *e.g.* "**Fig. 1 illustrates**" or "**results are shown in Table 2**".
- With LaTeX, you just need to `\label{}` your figure or table and then refer to it using the `\ref{}` command. To prevent unwanted line breaks before the figure/table number, use the *protected space* (*i.e.* the tilde symbol, ~) directly before `\ref{}`. Check the examples within this section on how to correctly use `~\ref{}`.

4.1 Typesetting a Table

- Table **captions must be self-explanatory**, *i.e.* the readers should understand what you want to show them (or what the listed values/scores mean) by just looking at the table data and reading its caption.
- If you add a table, it must be referenced within the manuscript text, *e.g.* "see Table 1"; "this is summarized in Table 1", *etc.*
- A numbered table is a *proper noun*, thus write "**see Table 1**" instead of "**see table 1**". Never ever use the (incorrect) abbreviation "**Tab. 1**".
- Typically, table captions should be placed above the table data (unless the specific template defines other layout requirements).
- Example 7 illustrates how to correctly typeset a table.

Guideline Example 7: Typesetting a Table

- **Table with caption:**

  Table 1: A good caption must be self-explanatory. Thus, we have to explain that higher *frobnability* scores indicate better performance.

Method	Frobnability
Theirs	0.23
Yours	0.80
Ours	1.00

- **Corresponding reference within the text:**
  Evaluation results are summarized in Table 1.

LaTeX

```
\begin{table}
  \centering
  \caption{A self-explanatory caption.}
  \label{tab:example1}
  \begin{tabular}{l|c}
    \hline
    \textbf{Method} & \textbf{Frobnability}\\\hline
    Theirs & 0.23 \\
    Yours  & 0.80 \\
    Ours   & 1.00 \\\hline
  \end{tabular}
\end{table}

Evaluation results are summarized in Table~\ref{tab:example1}.
```

4.2 Typesetting a Figure

- Figure **captions must be self-explanatory**, *i.e.* the reader should understand the "big picture" by just looking at the figure and reading its caption.
- Pay attention to image credits and avoid copyright infringement (see also Section 6)! **Explicitly state** if you **copied** a figure (write: *"Image taken from [X]"*) or **modified** a figure (*"Image adapted from [X]"*) within its caption.
- If you add a figure, it must be referenced within the manuscript text, *e.g.* "see Figure 1"; "this is illustrated in Fig. 2", *etc.*
- A numbered figure is a *proper noun*, thus write "**see Figure 1**" (or the abbrevated form "**see Fig. 1**") instead of "**see figure 1**".
- Typically, figure captions should be placed below the illustration (unless the specific template defines other layout requirements).
- Example 8 illustrates how to correctly typeset a figure.

Guideline Example 8: Typesetting Figures

- **Figures with caption:**

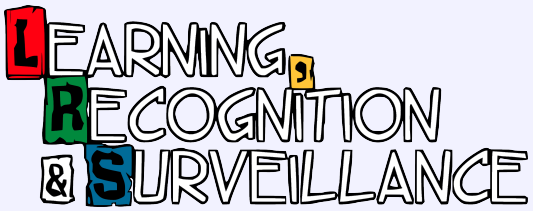
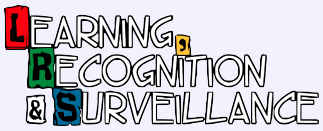


Figure 1: Figures must have self-explanatory captions – explain your reader what is shown; what do different colors mean; *etc.* If it isn't your original work, explicitly state "**Image taken from [15]**". If you modified an existing figure, explicitly state "**Image adapted from [15]**". Note that "**Illustration of the workgroup logo [15]**" is not correct – such a citation is ambiguous because it does not clearly state that the image was actually copied from somewhere else.



(a) Full workgroup logo.

(b) Shortened workgroup logo.

Figure 2: Two exemplary subfigures. Images taken from [11].

- **Corresponding reference within the text:**
  Our workgroup logos are shown in Figure 1 and 2.

LaTeX

```
\begin{figure}
    \centering
    \includegraphics[width=0.6\textwidth]{workgroup_logo1}
    \caption{Figures should have self-explanatory captions.
        Image taken from~\cite{lrs-website}.}
    \label{fig:example1}
\end{figure}

\begin{figure}
    \centering
    \subfloat[Institute logo.]{
        \includegraphics[width=0.35\textwidth]{workgroup_logo1}
    }\hspace{1cm}
    \subfloat[Workgroup logo.]{
        \includegraphics[width=0.35\textwidth]{workgroup_logo2}
    }
    \caption{Two exemplary subfigures.}
    \label{fig:example2}
\end{figure}

Our workgroup logos are shown in Figure~\ref{fig-example1}
and~\ref{fig-example2}.
```

5 Mathematical Writing

Integrating mathematics into your work can be a hurdle at first. The following recommendations help you achieve correct mathematical writing. These are based on commonly observed mistakes and also incorporate the basic rules coined by Mermin[6]. For more comprehensive discussions of this important topic, we recommend the text books on mathematical writing listed in Section 9.

- Integrating mathematics into your text can be done via **inline** formulations or by **numbered equations**.
- Inline formulations should be used for **short definitions or parameter settings**, such as "**we set** $x = 3$" or "$\mathbf{v} = (v_x, v_y, v_z)^\top$." More **complex expressions** or equations you need to refer to later on should be placed in a **separate numbered equation**.
- **Math is Prose** – all mathematical formulations are part of the text. Ensure that they are properly integrated into the reading flow, *i.e.* include them in a sentence and pay attention to **proper punctuation**.
- Ensure that **all variables and mathematical expressions are properly explained**. Don't let your reader "guess" what you wanted to express. Never use a variable without explicitly defining it beforehand.
- When referencing an equation, put its number into parentheses, *e.g.* "**see Equation (1)**". Note that LaTeX takes care of this if you use the `\eqref{}` command.
- A numbered equation is a *proper noun*, thus write "**in Equation (1)**" or the abbreviated form "**see Eq. (1)**" instead of "**in equation (1)**".
- Consider the following Example 9 which adheres to all of these simple rules:

Guideline Example 9: Math – Inline vs. Numbered

Throughout all experiments we set $\lambda = 1\mathrm{e}{-5}$.
The mass-energy equivalence states that

$$E = mc^2, \tag{1}$$

where m denotes an object's mass and c is the speed of light.
Recall Eq. (1) on the mass-energy equivalence ...

LaTeX

```
Throughout all experiments we set $\lambda = 1\mathrm{e}{-5}$.

The mass-energy equivalence states that
\begin{equation}
  E = m c^2,  \label{eq:equivalence}
\end{equation}
where $m$ denotes an object's mass and $c$ is the speed of light.

Recall Eq.~\eqref{eq:equivalence} on the mass-energy equivalence \dots
```

[6] Nathaniel David Mermin. What's wrong with these equations? *Physics Today, 42(10):9–11*, 1989. This short article is also available online from the *IEEE PAMI Technical Committee* at http://www.pamitc.org/documents/mermin.pdf

5.1 Exemplary Punctuation

The following Examples 10 and 11 demonstrate correct and wrong punctuation.

Guideline Example 10: Math – Correct Punctuation

We can compute the energy E as

$$E = \frac{1}{Q} \sum_{i=1}^{Q} |v_i - v_r|^2, \tag{2}$$

where Q denotes the number of samples and v_r is the reference value for the current iteration step r.

LaTeX

```
We can compute the energy $E$ as

\begin{equation}
  E = \frac{1}{Q} \sum_{i=1}^{Q}{|v_i - v_r|^2},
\end{equation}

\noindent where $Q$ denotes the number of samples and $v_r$ is the
reference value for the current iteration step $r$.
```

Guideline Example 11: Math – Wrong Punctuation

This leads to the following formula:

$$E = \frac{1}{Q} \sum_{i=1}^{Q} |v_i - v_r|^2 \tag{3}$$

Note the **missing punctuation mark** at the end and, additionally, that **the variables are not explained**.

5.2 More Complex Equations

- Sometimes you need to distinguish different **cases**, for example to define the return values of a function:

Guideline Example 12: Math – Cases

More formally, the Huber loss function is defined as

$$F(x) = \begin{cases} \frac{1}{2}x^2 & \text{if } |x| \leq 1, \\ |x| - \frac{1}{2} & \text{otherwise.} \end{cases} \tag{4}$$

LaTeX
```
More formally, the Huber loss function is defined as
\begin{equation}
  F(x) = \begin{cases}
           \frac{1}{2} x^2 & \text{if $|x| \leq 1$},\\
           |x| - \frac{1}{2} & \text{otherwise}.
         \end{cases}
\end{equation}
```

- There are many ways to typeset **matrices**. A common clearly laid out notation is:

Guideline Example 13: Math – Matrices

Given the camera's focal length f and its principal point $\mathbf{p} = (p_x, p_y)^\top$, we can project the 3D point $\mathbf{x}$ onto the image plane to obtain its pixel location

$$\mathbf{u} = \begin{bmatrix} f & 0 & p_x \\ 0 & f & p_y \\ 0 & 0 & 1 \end{bmatrix} \mathbf{x}. \tag{5}$$

LaTeX
```
Given the camera's focal length $f$ and its principal point
$\vec{p} = (p_x, p_y)^\top$, we can project the 3D point
$\vec{x}$ onto the image plane to obtain its pixel location
\begin{equation}
  \vec{u} =  \begin{bmatrix}
               f & 0 & p_x \\
               0 & f & p_y \\
               0 & 0 & 1
             \end{bmatrix} \vec{x}.
\end{equation}
```

- **Multi-line equations** can be used to expand or simplify terms, to state optimization constraints, *etc.* Use them to improve the reading flow of more complex equations:

Guideline Example 14: Math – Multiline Equations

We expand the squared term as

$$\begin{aligned} (a+b)^2 &= (a+b)(a+b), && (6)\\ &= a^2 + 2ab + b^2. && (7) \end{aligned}$$

Note that the equations are aligned at the (hidden) '&' symbol.

LaTeX
```
We expand the squared term as
\begin{align}
  (a + b)^2 &= (a + b) (a + b), \\
     &= a^2 + 2ab + b^2.
\end{align}
Note that the equations are aligned at the (hidden) '\&' symbol.
```

6 Plagiarism

Plagiarism is not tolerated! Follow the recommendations in Sections 2 and 4 and pay attention to the examples within this section to create scientifically correct documents.

6.1 Examples

While copied text passages without correct citation are rather easy to spot, there are less obvious cases which still plagiarize other works. To prevent you from (unintentionally) plagiarizing texts, we provide the following examples which are reconstructed[7] from real cases we had to deal with more often than we prefer. Note, however, that (1) **these examples are not exhaustive** and (2) "just" plagiarize text – if you copied other content or even just an idea from someone else without proper credits instead, it would still be plagiarism (recall the official definition of plagiarism in Section 2)!

Guideline Example 15: Plagiarism – Copied Text

Copied

To distinguish object pixels $\mathbf{x} \in \mathcal{O}$ from surrounding background pixels, Possegger *et al.* [1] employ a color histogram based Bayes classifier on the input image I. Let $H^I_\Omega(b)$ denote the b-th bin of the non-normalized histogram H computed over the region $\Omega \subset I$ [1]. Additionally, let $b_\mathbf{x}$ denote the bin b assigned to the color components of $I(\mathbf{x})$ [1]. Given a rectangular object region O (*i.e.* initial bounding box annotation or current tracker hypothesis) and its surrounding region S, [1] applies Bayes rule to obtain the object likelihood at location $\mathbf{x}$ as

$$P(\mathbf{x}\in\mathcal{O}|O,S,b_\mathbf{x}) \approx \frac{P(b_\mathbf{x}|\mathbf{x}\in O)\,P(\mathbf{x}\in O)}{\sum_{\Omega\in\{O,S\}} P(b_\mathbf{x}|\mathbf{x}\in\Omega)\,P(\mathbf{x}\in\Omega)}. \quad (1)$$

In particular, they estimate the likelihood terms directly from color histograms, *i.e.* $P(b_\mathbf{x}|\mathbf{x}\in O) \approx H^I_O(b_\mathbf{x})/|O|$ and $P(b_\mathbf{x}|\mathbf{x}\in S) \approx H^I_S(b_\mathbf{x})/|S|$, where $|\cdot|$ denotes the cardinality [1]. Furthermore, the prior probability can be approximated as $P(\mathbf{x}\in O) \approx |O|/(|O|+|S|)$. Then, Eq. (1) simplifies to

$$P(\mathbf{x}\in\mathcal{O}|O,S,b_\mathbf{x}) = \begin{cases} \frac{H^I_O(b_\mathbf{x})}{H^I_O(b_\mathbf{x})+H^I_S(b_\mathbf{x})} & \text{if } I(\mathbf{x})\in I(O\cup S) \\ 0.5 & \text{otherwise,} \end{cases} \quad (2)$$

where unseen pixel values are assigned the maximum entropy prior of 0.5 [1]. This generative model already allows to distinguish object and background pixels [1].

However, one of the most common problems of color-based online trackers remains [1]. Namely, that such algorithms may drift to nearby regions which exhibit a similar appearance compared to the object of interest [1].

- The blue highlights indicate text passages which have been copied from "[1]".
- This is **clearly plagiarized**, even though the original reference is stated at every sentence. Don't make this mistake – **never ever copy content, not even a single sentence!**
- For the (extremely) rare case where you really have to copy a statement, use direct quotations (*cf.* Section 2).
- If you need to cite a reference for every single sentence (as in this example), something does not seem right. This usually indicates either a **severe structural or logical issue of your work**.
  In a well-written paper each paragraph should present information based on a single (or very few) reference(s). Thus, it should be clear to the reader

[7] All examples within this section plagiarize text from Possegger *et al.*, *In Defense of Color-based Model-free Tracking*, published in the *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2015 – in particular, the first two paragraphs of their Section 3.1.

that all the content is based on the same source (which you only need to cite once, ideally at the beginning of the paragraph), see also Example 18.

Guideline Example 16: Plagiarism – Paraphrased Text

Paraphrased

Possegger *et al.* [1] employ a naïve Bayes model to distinguish object pixels $\mathbf{x} \in \mathcal{O}$ from their surrounding background $\mathbf{x} \in \mathcal{S}$. Given the non-normalized histogram $H^I_\Omega(b)$ computed over the region $\Omega \subset I$, $b_\mathbf{x}$ denotes the bin b assigned to the RGB components of $I(\mathbf{x})$. Then, for an object region O and its surrounding region S, Bayes rule can be applied to obtain the object likelihood as the conditional probability

$$P(\mathbf{x}\in\mathcal{O}|O,S,b_\mathbf{x}) \approx \frac{P(b_\mathbf{x}|\mathbf{x}\in O)\,P(\mathbf{x}\in O)}{\sum_{\Omega\in\{O,S\}} P(b_\mathbf{x}|\mathbf{x}\in\Omega)\,P(\mathbf{x}\in\Omega)}. \tag{3}$$

By leveraging color histograms, these likelihood terms can be estimated as $P(b_\mathbf{x}|\mathbf{x}\in O) \approx H^I_O(b_\mathbf{x})/|O|$ and $P(b_\mathbf{x}|\mathbf{x}\in S) \approx H^I_S(b_\mathbf{x})/|S|$, where $|\cdot|$ denotes the set's cardinality. Furthermore, the prior probability can be approximated from the size of the object and surrounding regions as $P(\mathbf{x}\in O) \approx |O|/(|O|+|S|)$. Then, Eq. (3) simplifies to the generative model

$$P(\mathbf{x}\in\mathcal{O}|O,S,b_\mathbf{x}) = \begin{cases} \frac{H^I_O(b_\mathbf{x})}{H^I_O(b_\mathbf{x})+H^I_S(b_\mathbf{x})} & \text{if } I(\mathbf{x})\in I(O\cup S) \\ 0.5 & \text{otherwise,} \end{cases} \tag{4}$$

where unseen pixel values are assigned the maximum entropy prior of 0.5.

This, however, fails to address one of the most common problems of color-based online trackers which is that such algorithms may drift to nearby regions with similar appearance compared to the tracked object. To overcome this limitation, they adjust the object model accordingly to suppress distracting regions.

- The **most common mistake by novice writers** is to paraphrase text.
- Although the text is significantly modified from the original work (rephrased and slightly restructured), **this is still plagiarized** and is not tolerated!
- To avoid this, you have to summarize their work in your own words and properly cite the sources, see Example 18.

Guideline Example 17: Plagiarism – Translated Text

Translated

Naive Bayes-Klassifikatoren können verwendet werden, um Bildpunkte am Objekt $\mathbf{x} \in \mathcal{O}$ vom Hintergrund zu unterscheiden. Dazu berechnen wir zunächst das nicht-normalisierte Farbhistogramm H^I_Ω über den Bildbereich $\Omega \subset I$. Weiters bezeichnen wir mit $b_\mathbf{x}$ den Histogrammbalken, der den RGB Farbkomponenten $I(\mathbf{x})$ zugeordnet ist. Anschließend kann anhand der initial annotierten Objektposition O (üblicherweise als Rechteck gegeben) und dessen direkter Umgebung U die bedingte Wahrscheinlichkeit, dass sich das Objekt an einer bestimmten Position $\mathbf{x}$ befindet, unter Anwendung des Bayes-Theorems als

$$P(\mathbf{x}\in\mathcal{O}|O,U,b_\mathbf{x}) \approx \frac{P(b_\mathbf{x}|\mathbf{x}\in O)\,P(\mathbf{x}\in O)}{\sum_{\Omega\in\{O,U\}} P(b_\mathbf{x}|\mathbf{x}\in\Omega)\,P(\mathbf{x}\in\Omega)} \tag{5}$$

bestimmt werden. Nun können wir die benötigten Terme mit Hilfe von Farbhistogrammen einsetzen: $P(b_\mathbf{x}|\mathbf{x}\in O) \approx H^I_O(b_\mathbf{x})/|O|$ und $P(b_\mathbf{x}|\mathbf{x}\in U) \approx H^I_S(b_\mathbf{x})/|U|$, wobei $|\cdot|$ die Mächtigkeit der jeweiligen Menge bezeichnet. Die A-priori-Wahrscheinlichkeit $P(\mathbf{x}\in O) \approx |O|/(|O|+|U|)$ kann ebenso aus der initialen Annotation abgeleitet werden. Damit können wir Gleichung (5) zu

$$P(\mathbf{x}\in\mathcal{O}|O,U,b_\mathbf{x}) = \begin{cases} \frac{H^I_O(b_\mathbf{x})}{H^I_O(b_\mathbf{x})+H^I_U(b_\mathbf{x})} & \text{falls } I(\mathbf{x})\in I(O\cup U) \\ 0.5 & \text{sonst,} \end{cases} \tag{6}$$

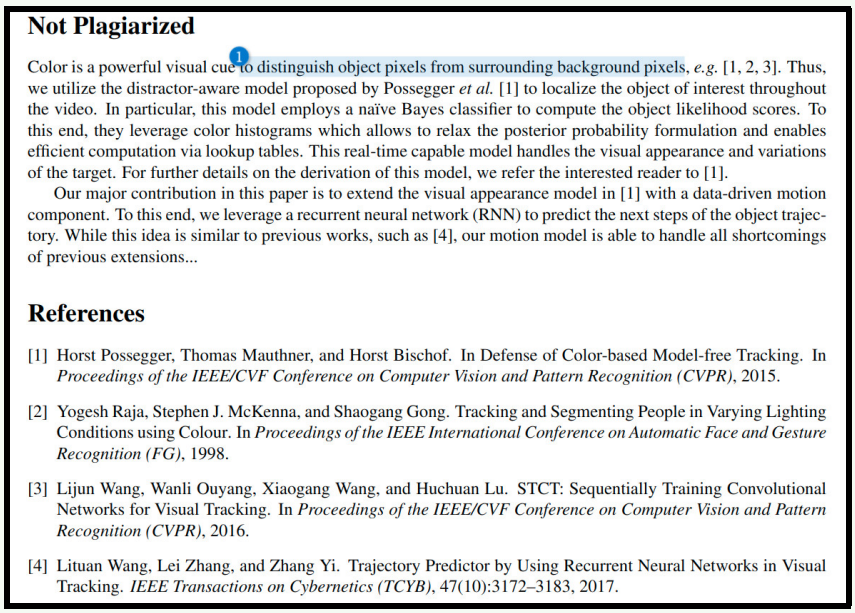
vereinfachen und erhalten ein generatives Modell zur Unterscheidung von Objekt- und Hintergrundpixel.

Diese Formulierung ist nichtsdestotrotz noch immer anfällig gegenüber "Drifting", einem Hauptproblem von farbbasierten Trackingansätzen. Dabei werden visuell ähnliche Bildregionen mit dem tatsächlich verfolgten Objekt verwechselt. Um dieses Problem zu beheben, muss das farbbasierte Objektmodell entsprechend ergänzt werden, um solche Störeinflüsse rechtzeitig erkennen und unterdrücken zu können.

- At first glance, this looks like an original work from the author. However,the **text has just been translated** (from English to German, including some minor modifications) and **thus, is again plagiarized**.
- Save yourself (and your supervisor[a]) the trouble and effort and **never copy, paraphrase or translate any content!**

[a]Quite honestly, "thanks to" several former students and their (failed) attempts, we know what to look for – and although it's definitely neither fun nor easy to do, we're quite unerring in tracking down the actual source.

Guideline Example 18: Avoiding Plagiarism



Not Plagiarized

Color is a powerful visual cue to distinguish object pixels from surrounding background pixels, *e.g.* [1, 2, 3]. Thus, we utilize the distractor-aware model proposed by Possegger *et al.* [1] to localize the object of interest throughout the video. In particular, this model employs a naïve Bayes classifier to compute the object likelihood scores. To this end, they leverage color histograms which allows to relax the posterior probability formulation and enables efficient computation via lookup tables. This real-time capable model handles the visual appearance and variations of the target. For further details on the derivation of this model, we refer the interested reader to [1].

Our major contribution in this paper is to extend the visual appearance model in [1] with a data-driven motion component. To this end, we leverage a recurrent neural network (RNN) to predict the next steps of the object trajectory. While this idea is similar to previous works, such as [4], our motion model is able to handle all shortcomings of previous extensions...

References

[1] Horst Possegger, Thomas Mauthner, and Horst Bischof. In Defense of Color-based Model-free Tracking. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2015.

[2] Yogesh Raja, Stephen J. McKenna, and Shaogang Gong. Tracking and Segmenting People in Varying Lighting Conditions using Colour. In *Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 1998.

[3] Lijun Wang, Wanli Ouyang, Xiaogang Wang, and Huchuan Lu. STCT: Sequentially Training Convolutional Networks for Visual Tracking. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016.

[4] Lituan Wang, Lei Zhang, and Zhang Yi. Trajectory Predictor by Using Recurrent Neural Networks in Visual Tracking. *IEEE Transactions on Cybernetics (TCYB)*, 47(10):3172–3183, 2017.

This example applies these basic rules to avoid plagiarism:

- **Summarize** the work of others in your own words.
- **Properly cite** the used (non-paper) sources, *e.g.* when you use someone else's framework, use their dataset, follow their evaluation protocol, *etc.*
- Instead of copying content, **refer the reader** to the corresponding source for further details.

6.2 Plagiarism vs. Copyright

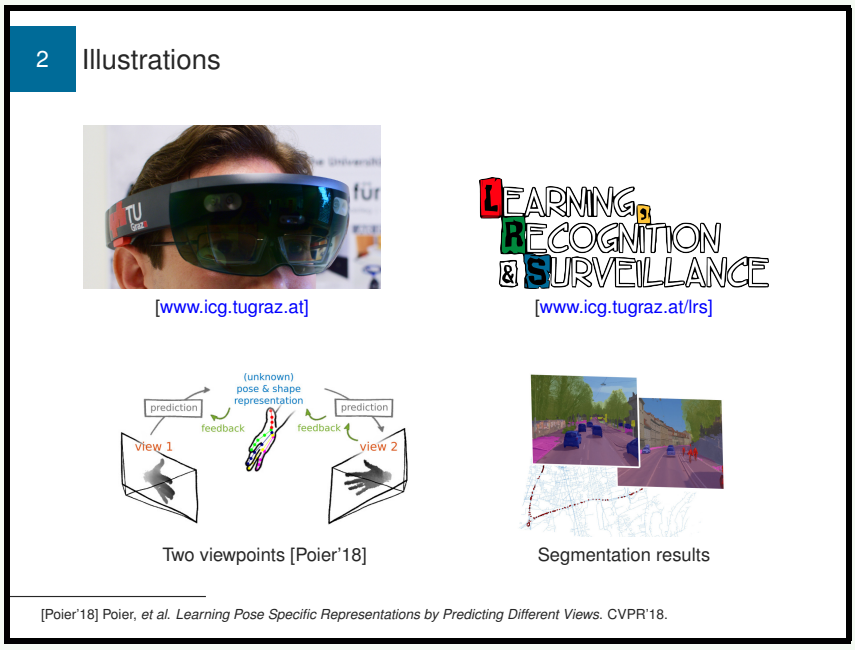
Be aware that just because a paper is *scientifically correct* and not plagiarized, this does not mean that it does not violate copyright law. Publishing companies typically hold the copyright of the papers they publish (including illustrations). Thus, if you copy an illustration from someone else's paper (without permission from the copyright holder), **you may breach the copyright**, even if you cite their paper correctly by stating "*Image taken from [1].*"

7 Best Practices for Slide Decks

This section summarizes the most important tips to prepare a slide deck for a scientific presentation. These easy-to-apply guidelines ensure a) that your slides are informative/useful for your audience and b) that you will correctly reference sources. For suggestions on improving your presentation skills, we recommend the text books listed in Section 9.

- Avoid the **notorious *list-of-all-references* slide(s)** at the end of your presentation. Do you really think anybody will remember the relevant reference number/name throughout your talk (until you reach the bibliography slide) or be able to locate the relevant entry in this list within the few seconds you show this slide?
- Instead, **place the referenced sources on the corresponding slide** – best within the footer region (see the following examples).
- State the **source/reference for each figure, video, table, etc.**
- Whatever template you use, ensure that there's a **number on each slide**. This allows your audience to easily refer to a slide while asking questions.

Guideline Example 19: Slides – Image Sources

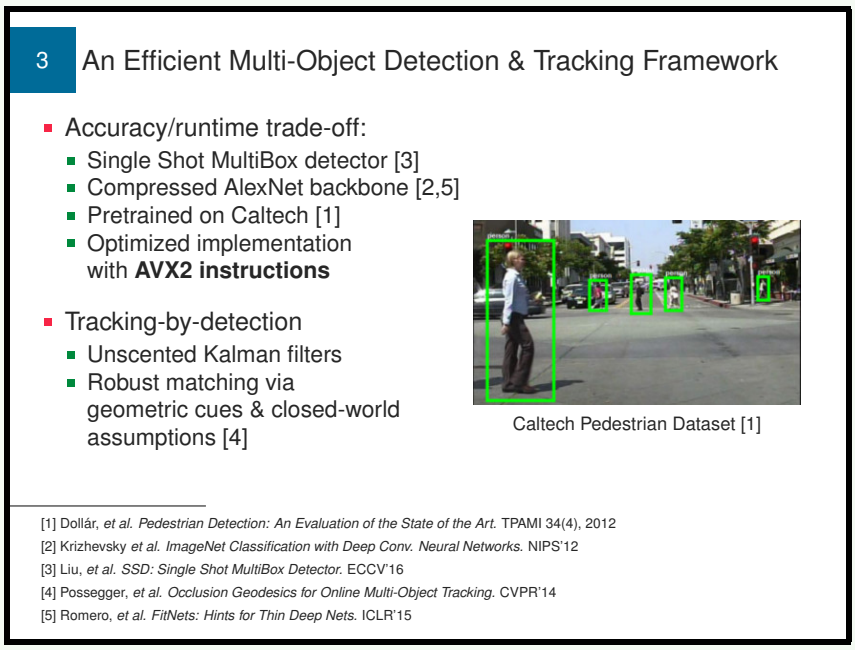


- Place **references within square brackets** to easily tell copied content from your own contribution/creation. In the example above, the bottom-right figure has been created by the author/speaker (whereas all others have been taken from somewhere else).
- Avoid long URLs (e.g. when you copy illustrations) which would clutter your slides. **Shorten web links and use hyperlinks** to the full URL instead. For example, the top-left image source `[www.icg.tugraz.at]` is a hyperlink pointing to `https://www.icg.tugraz.at/some/long_and_cluttered/path/to/the/actual/image.jpg`
- In contrast to a paper/thesis/report, a single slide offers only very limited space.

Thus, we recommend to shorten citations/paper references as follows (see also [Poier'18] in this example):

- abbreviate the author list (*cf.* Section 2.3),
- use the conference/journal acronym (here: *CVPR*) instead of the full name,
- omit the *"In Proceedings of the"* prefix (which is needed for written reports to indicate that the paper has been published at a conference), and
- optionally shorten the year of publication.

Guideline Example 20: Slides – Referencing Papers



- **Choose a numbering/citation style** and **use it consistently!** The two most common styles for presentations are either numeric (this example, *i.e.* [1]) or using the author name and publication year (as shown on the previous Example 19, *i.e.* [Poier'18]).
- Similarly, consistently sort the references either by order of appearance or alphabetically (author names).

Guideline Example 21: Slides – Single Reference for Slide

4 Trajectory Preprocessing

- Trajectory may contain outliers
- Smooth & simplify the trajectory
- This reduces jitter and speeds up the following processing steps

Douglas & Peucker. *Algorithms for the Reduction of the Number of Points Required to Represent a Digitized Line or Its Caricature.* Cartographica 10(2):112–122, 1973.

The content of this slide is solely based on the given reference (as would also be mentioned in the accompanying talk). Thus, we can omit the explicit reference within the slide text.

Guideline Example 22: Slides – Don'ts

By now, you should have an idea why the following slides are bad examples:

How to prepare a bad slide?
Don't do this!

- Mix different fonts and sizes
- Don't check fr typogrphicl mistakes
- Use punctuation inconsistently.
- Forget the slide number so noone can refer to this slide
- Put all the text you're going to say on the slide – surely, your audience loves to read along with you
- Save the references for the last slide, so nobody knows which papers you're currently talking about
- Mix different citation styles (*e.g.* [1] and [VWA'19])
- Don't typeset equations, but include low-quality screenshots instead: $\int_0^\infty e^{-ax^2}\mathrm{d}x = \frac{1}{2}\sqrt{\int_{-\infty}^{\infty} e^{-ax^2}\mathrm{d}x \int_{-\infty}^{\infty} e^{-ay^2}\mathrm{d}y} = \frac{1}{2}\sqrt{\frac{\pi}{a}}.$

A list of all my references

Don't do this!

- **Be inconsistent:** use different names for the same conference/journal, use different reference styles, *etc.*
- Use a tiny font size so you can fit all references in this list

[1] Cavanagh & Alvarez. *Tracking Multiple Targets with Multifocal Attention.* TICS 9(7), 2005

[2] Dollár, *et al. Pedestrian Detection: An Evaluation of the State of the Art.* TPAMI 34(4), 2012

[3] Liu, *et al. SSD: Single Shot MultiBox Detector.* ECCV'16

[4] Krizhevsky *et al. ImageNet Classification with Deep Conv. Neural Networks.* NIPS'12

[Poier'18] Poier, *et al. Learning Pose Specific Representations by Predicting Different Views.* CVPR'18.

[5] Possegger, *et al. Occlusion Geodesics for Online Multi-Object Tracking.* IEEE Conference on Computer Vision and Pattern Recognition (instead of the acronym CVPR as used for [Poier'18]), 2014 (instead of the abbreviated **'14** as for other conference papers in this list).

[6] Romero, *et al. FitNets: Hints for Thin Deep Nets.* ICLR'15

[7] Rudelsdorfer *et al. A novel Method for the Analysis of Sequential Actions in Team Handball.* IJCSS 13(1), 2014

[8] Sternig *et al. Multi-camera Multi-object Tracking by Robust Hough-based Homography Projections.* ICCVW VS'11

8 Scientific Writing & Language

This section summarizes common specialties and caveats of writing (scientific) texts (Sections 8.1 and 8.2) and presents a short list of useful LaTeX quirks (Section 8.3).

8.1 Specialties of Scientific Writing

"I" vs. "We":

- A common practice in scientific texts (especially within the Computer Science community) is to use the ***author's "we"*** (*i.e. pluralis auctoris*, *pluralis modestiae*). This means that you should always use the pronoun "we" when referring to yourself, your work or your findings. Thus, in a scientific text, always write "**we** propose/evaluate/*etc.*" instead of "**I** propose/evaluate/*etc.*" – even if you did all the work yourself.
- Avoid plagiarism when summarizing related work or writing a survey paper – **do not copy another author's "*we [...]*"** phrases. If you write "**we show [...]**" or "**we propose [...]**" while summarizing someone else's paper, you confuse the reader (in addition to violating scientific and ethic principles).

Correct Capitalization:

- Capitalize **proper names**, such as **the Euclidean distance** or **the Gaussian distribution**.
- **Numbered elements** (figures, tables, equations, sections and chapters) are *proper nouns*. Thus, capitalize these words when referring to a numbered element of your paper, *e.g.* **see Fig. 1**; **summarized in Table 2**; **as defined in Eq. (3)**; **refer to Sec. 5 for details**; *etc.* However, do not capitalize these words without numbering, *e.g.* "**This section** presents our findings [...]" or "In **the following chapter**, we will see [...]".
- There are no fixed rules for **capitalization of headings**. In fact, different style guides and paper templates define different rules. As a general rule of thumb the first word, the last word, and all important words should be capitalized.
  According to the *Chicago Manual of Style*[8], you should capitalize
  - nouns, pronouns, verbs,
  - adjectives, adverbs, and
  - subordinating conjunctions (after, because, if, while, *etc.*),

  but do not capitalize
  - articles (a, an, the),
  - coordinating conjunctions (and, but, for),
  - prepositions (against, as, between, in, at, by, from, *etc.*), and
  - the "to" in infinitives.

  An exception is the *sentence case* where we use a full sentence as heading. To increase the readability in such cases, we use standard capitalization rules, *e.g.* "**How to give a good presentation?**" or "**An image is worth a thousand words.**"

Abbreviations:

- When using **abbreviations**, make sure that you define them upon their first use:

[8] *Chicago Manual of Style*. The University of Chicago Press, 17th edition, 2017. This is a widely used style guide for American English.

Guideline Example 23: Correct Abbreviations

He worked at the **National Aeronautics and Space Administration (NASA)**, where he implemented an approach to identify suitable landing spots for the Mars rover based on **Convolutional Neural Networks (CNN)**.
In LaTeX, use a protected space to prevent incorrect line breaks between a definition and its abbreviation:
`National␣Aeronautics␣and␣Space␣Administration~(NASA).`

- Well-known abbreviations should also be defined upon their first use. However, here you can first state the abbreviation and put the definition within parentheses, *e.g.* **GPS (Global Positioning System)**
- Abbreviations can be used as *proper nouns* and do not require circumlocutions. For example, "we apply **SVD**[9]." instead of "we apply **the SVD method**"; or "to create a panorama, we use **SIFT**[10] **features**" instead of "to create a panorama, we use **features extracted from the SIFT method**".

Reading Flow and Wording:

- Use scientific diction/professional wording. For example, compare "**a large data set/a large amount of data**" *versus* "**a big set of data**".
- Similarly, never use **"one"** (as in "**one can see that [...]**" or "**one can compute ω_i**"). Replace it by the *author's "we"*: "**we can see that [...]**" or "**we compute ω_i**".
- Note that standard English words may have (slightly) different meanings in different scientific communities. For example, computer scientists distinguish between **images** (German: Bild, Abbildung) and **pictures** (German: Gemälde, Darstellung).
- To improve the reading flow, avoid **widows** and **orphans** that are separated from the rest of the text.
  - Widow: A paragraph-ending line at the beginning of the following page or column.
  - Orphan: A paragraph-opening line at the bottom of a page or column.

8.2 Language

- Use a **consistent language** – do not mix *British English* (BE) and *American English* (AE) in the same document.
- In contrast to many German texts, write **short sentences** in English documents. For scientific papers, short sentences significantly improve the reading flow (and thus prevent your reader from falling asleep).
- Paragraphs should consist of approximately 3–5 sentences. Shorter paragraphs impede the reading flow and prevent the reader from absorbing the information you want to provide.
- **Transition words** – such as *therefore*, *thus*, *hence*, *however*, *nevertheless*, and others – should always be separated from the remaining sentence by a comma: "**the truth, however, is that writing takes a lot of practice**".

[9] Singular value decomposition (SVD).
[10] Scale-invariant feature transform (SIFT).

- Always separate the abbreviations "***i.e.***" (Latin: *id est*, meaning "that is") or "***e.g.***" (Latin: *exemplī grātiā*, meaning "for example") from the text by a leading comma. For example, "there are many NP-hard **problems, *e.g.*** the subset sum or the traveling salesman". In *American English* texts, you should also place an additional comma after these abbreviations, such as "we investigate several learning **approaches, *e.g.*,** boosting and support vector machines".

- **Proofread your document!** Use both a *spell checker* and a *grammar checker* to find typographical and grammatical errors. For example, you can use the spell/grammar checking functionality built into office applications (such as Microsoft Word or LibreOffice), use specialized software packages for spell checking (*e.g.* `aspell` or `hunspell` on Unix), or use online grammar checking services.
  However, **always use such tools with a grain of salt** – these tools are a great means to identify common errors, but they may also miss some errors or incorrectly warn you due to some of the above mentioned specialties of scientific texts in contrast to standard literature.

8.3 Typesetting Specialties in LaTeX

- To typeset **umlauts & diacritics**, we recommend using LaTeX special characters as in the following example. Alternatively, you can include various packages to directly typeset these characters in your editor – for this, check the documentation of LaTeX packages `inputenc` (with option `utf8`), `fontenc` (with option `T1`) and `babel` (which takes care of correct hyphenation of words).

Guideline Example 24: LaTeX – Umlauts & Diacritics

To typeset accented characters within bibliography fields, you need to put them in curly braces: ä å ê ì İ ø ő ú ç ğ ł ñ ř ß
Outside the bibliography, curly braces are not required (but still recommended) to typeset "Umlautwörter".

LaTeX

```
To typeset accented characters within bibliography fields,
you need to put them in curly braces:
{\"a} {\aa} {\^e} {\‘i} {\.I} {\o} {\H o} {\’u}
{\c c} {\u g} {\l} {\~n} {\v r} {\ss}

Outside the bibliography, curly braces are not required (but
still recommended) to typeset ‘‘Umlautw\"orter’’.
```

- There are several **special characters** which you need to escape to successfully compile your PDF file:

Guideline Example 25: LaTeX – Special Characters

You must escape & (ampersand), % (percent sign), # (pound sign), $ (dollar sign), { } (curly braces), ^ (caret), and _ (underscore).
Use special commands for ~(tilde) and \(backslash).

LaTeX

```
You must escape \& (ampersand), \% (percent sign),
\# (pound sign), \$ (dollar sign), \{ \} (curly braces),
\^{} (caret), and \_ (underscore).

Use special commands for \textasciitilde (tilde) and
\textbackslash (backslash).
```

- Note the differences between **hyphen** (German: Bindestrich) and **dash** (German: Gedankenstrich):

Guideline Example 26: LaTeX – Hyphen vs. Dash

Use a (single) dash only for compound words, such as "well-known", "state-of-the-art", "graph-based", *etc.*
Use a hyphen (double dash) to indicate a range, *e.g.* "see pages 3–5".

LaTeX

```
Use a (single) dash only for compound words, such as ``well-known'',
``state-of-the-art'', ``graph-based'', \emph{etc.}

Use a hyphen (double dash) to indicate a range, \emph{e.g.} ``see
pages 3--5''.
```

- Use **protected spaces** to prevent line breaks, *e.g.* between text and a reference or a definition and its abbreviation:

Guideline Example 27: LaTeX – Correct Usage of Protected Spaces

Smith [15] was a pioneer of frambozing the staten.
They applied a Recurrent Neural Network (RNN) to improve the accuracy of the speech recognition module.

LaTeX

```
Smith~\cite{smith14} was a pioneer of frambozing the staten.

They applied a Recurrent Neural Network~(RNN) to improve the accuracy
of the speech recognition module.
```

Guideline Example 28: LaTeX – Incorrect Usage of Protected Spaces

Don't mix standard and protected spaces, like here␣␣[15].
Protected spaces prevent breaking this rather long line. It looks ugly, but that's the point.

LaTeX

```
Don't mix standard and protected spaces, like here ~\cite{smith14}.

Protected~spaces~prevent~breaking~this~rather~long~line.~It~looks~
ugly,~but~that's~the~point.
```

9 Further Reading

This guideline document can only provide a very concise overview of the most important topics for novice writers. If you are interested in more details, we recommend the following books:

Writing in General:

- Robert Lawrence Trask. *The Penguin Guide to Punctuation.* Penguin Books, 1st edition, 1997.
- Robert Lawrence Trask. *The Penguin Dictionary of English Grammar.* Penguin Books, 1st edition, 2000.
- *Chicago Manual of Style.* The University of Chicago Press, 17th edition, 2017.
- *New Hart's Rules: The Oxford Style Guide.* Oxford University Press, 2014.

Scientific Writing:

- Michael Alley. *The Craft of Scientific Writing.* Springer, 4th edition, 2018.
- Jean-Luc Lebrun. *Scientific Writing 2.0: A Reader and Writer's Guide.* World Scientific Publishing Company, expanded edition, 2011.
  Note: an updated "Scientific Writing 3.0" is scheduled for release in November 2021.
- Phillis Creme and Mary R. Lea. *Writing at University: A Guide for Students.* Open University Press, 2003.
- *MLA Handbook for Writers of Research Papers.* The Modern Language Association of America, 7th edition, 2009.
- Adrian Wallwork. *English for Academic Research: Grammar, Usage and Style.* Springer, 1st edition, 2015. Corrected 2nd printing.

Mathematical Writing:

- Nathaniel David Mermin. What's wrong with these equations? *Physics Today*, 42(10):9–11, 1989.
- Franco Vivaldi. *Mathematical Writing.* Springer, 2014.
- Donald Ervin Knuth, Tracy Larrabee, and Paul M. Roberts. *Mathematical Writing.* The Mathematical Assocation of America, 1989.
- Donald Ervin Knuth. *The TEXbook.* Addison-Wesley Professional, 1st edition, 1986.

Scientific Presentations:

- Jonathan Schwabish. *Better Presentations: A Guide for Scholars, Researchers, and Wonks.* Columbia University Press, 1st edition, 2016.

List of Guideline Examples

List of Required Bibliography Fields