

Scientific Writing in a Nutshell

Dr. Matthieu-P. Schapranow

Summer 2023

- Submission no later than Sun Sep 3, 2023 containing:
 - All your contributions, prototypes, models, source code as a zip archive,
 - Brief instruction how to make it working, and
 - Your final report as PDF version + source, e.g. Latex/Word, figures, etc.
- Final report
 - Format: IEEE two-column conference, A4 templates available at <https://www.ieee.org/conferences/publishing/templates.html>
 - Length max. 6 full pages (excl. appendices, references, figures)

Accessing the templates

Microsoft Word

- [US letter](#) (DOC, 30 KB) **Updated Jan 2019**

- [A4](#) (DOC, 30 KB) **Updated Jan 2019**

[LaTeX Template Instructions](#) (PDF, 63 KB) [Be sure to use the template's **conference** mode.]

- [Template](#) (ZIP, 700 KB) **Updated October 2019**

- [LaTeX Bibliography Files](#) (ZIP, 309 KB)

Overleaf

- When working in Overleaf, the template is available at <https://www.overleaf.com/gallery/tagged/ieee-official>

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Can Emojis Make Science?



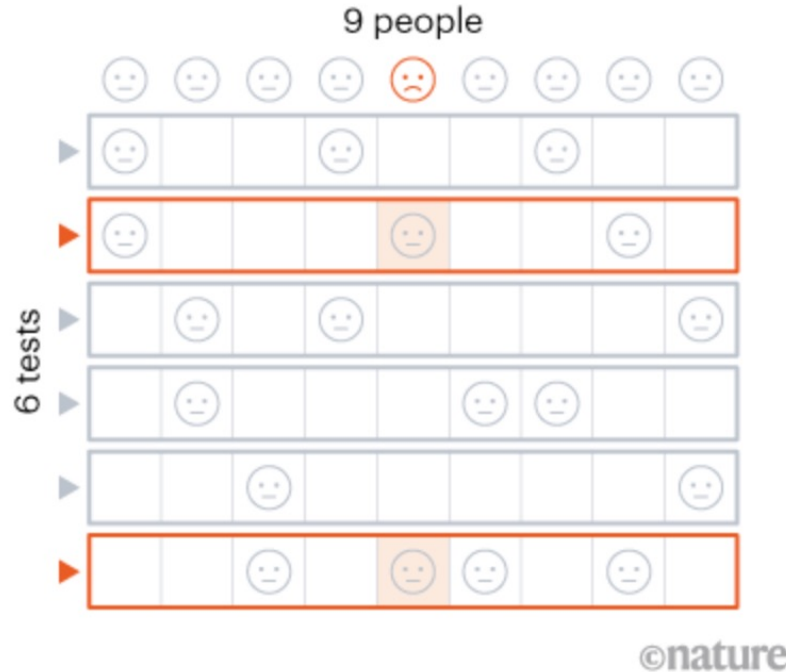
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Emojis May Help Science!

Method 4

This method uses only one round of testing. Samples are distributed into a matrix of overlapping groups.



▼ nature



NEWS • 10 JULY 2020

The mathematical strategy that could transform coronavirus testing

Four charts show how pooling samples from many people can save time or resources.

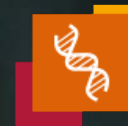
Smriti Mallapaty

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Structure

The Fairytale Approach



1. Introduction
2. Main part
3. Conclusion



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Structure

The IMRAD Approach



1. Introduction
2. Methods
3. Results (Main part) and
4. Discussion and Conclusion



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Structure

The Engineering Papers Approach



1. Introduction
2. Related Work
3. Methods
4. Contribution(s)
5. Evaluation
6. Discussion
7. Conclusion and Outlook



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Title

- Aim: Make the reader curious about your work
- Catchy, but precise
- Not too long, because you want it to be indexed

The nucleotide sequence of a 3.2 kb segment of mitochondrial maxicircle DNA from *Crithidia fasciculata* containing the gene for cytochrome oxidase subunit III, the N-terminal part of the apocytochrome *b* gene and a possible frameshift gene; further evidence for the use of unusual initiator triplets in trypanosome mitochondria

Paul Sloof, Janny van den Burg, Arthur Voogd, Rob Benne

Nucleic Acids Research, Volume 15, Issue 1, 12 January 1987, Pages 51–65,

<https://doi.org/10.1093/nar/15.1.51>

Published: 12 January 1987 Article history ▼

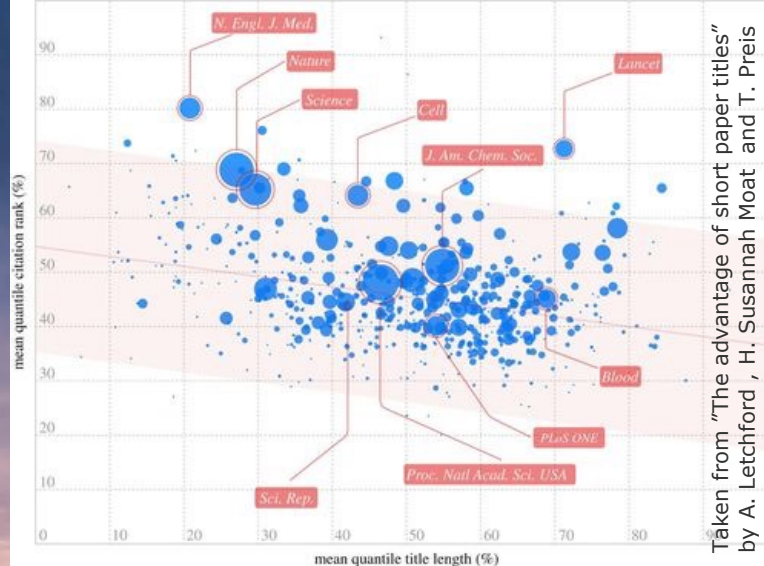
Molecular mechanical models for organic and biological systems going beyond the atom centered two body additive approximation: aqueous solution free energies of methanol and N-methyl acetamide, nucleic acid base, and amide hydrogen bonding and chloroform/water partition coefficients of the nucleic acid bases

Piotr Cieplak, James Caldwell, Peter Kollman

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Taken from "The advantage of short paper titles" by A. Letchford, H. Susannah Moat and T. Preis

Abstract

- Aim: Make the reader understand the scope of your contribution
- Answer the following four questions:
 1. What is the state of the art?
 2. What are the limitations of the current state?
 3. What is your contribution?
 4. How does your contribution improve the state of the art?
- Review your abstract at the end of your work to check whether it is still aligned

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1. Introduction

- Aim: Brief intro into the topic not an academic lecture
- Guide the reader to the topic but do not make a complete lecture out of it
- Name some well-known work
- You might want to refer to an important figure or graph in your intro an place it on the first page to make your work look unique
- The last paragraph shares details about the structure of your document, e.g. "The remainder of the work is structured as follows: Sect. 1..."

Towards An Integrated Health Research Process: A Cloud-based Approach

Mathias P. Schapranow¹, Matthias Uecker¹, Murat Serier², Sebastian Sender³,
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² Technology, Methods, and Infrastructure for Networked Medical Research,

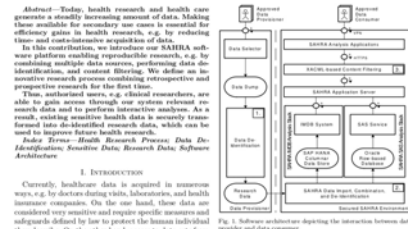
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2. Related Work

- Aim: Show you know other's work and can set your contribution in the context
- Do literature review and share your results, e.g. IEEE, PubMed, ACM, SpringerLink, Google Scholar, etc.
- Name selected approaches and stress how your work differs, extends, matches, etc.
- You might want to create a structured overview of features for individual approaches whilst your work combines multiple or new approaches

Table 1: Tools surveyed. Abbreviations: GP-General Purpose, BSP-Biomedical Software Platform. Legend: ●-Fully supported; ●-Partially supported; ○-Not supported.

Category	Tool	Functional Requirements																		Non-Functional						
		Preparation			DS Selection			Prod. Handling			M. Generation			Eval. & Validation			Interpretation			Presentation			NF			
		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	NF1	NF2	NF3	
GP	Statistical Packages [1, 30, 40]	○	○	○	●	○	○	●	●	●	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	●
	ML Toolkits [14, 21, 28, 39, 41]	○	○	○	○	○	○	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Scientific Computing [17, 25, 51]	○	○	○	○	○	○	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	ML Suites [16, 22, 25, 31]	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
BSP	transSMART [49]	●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	ATLAS [19]	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	MLBCD [36]	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	ExpBIO [11]	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	PLP R package [46]	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	MORPHER	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

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Photo by Güler Ergin

3. Methods



- Aim: Outline how you worked methodically to get your findings
- What particular methods did you use throughout your work, e.g. design thinking, software engineering, machine learning methods, quantitative measurements, etc.
- Why did you select them / follow them, e.g. mentioned by others, make your work comparable to other's work, etc.
- What particular approach did you use for what; you might want to refer to other parts of your paper

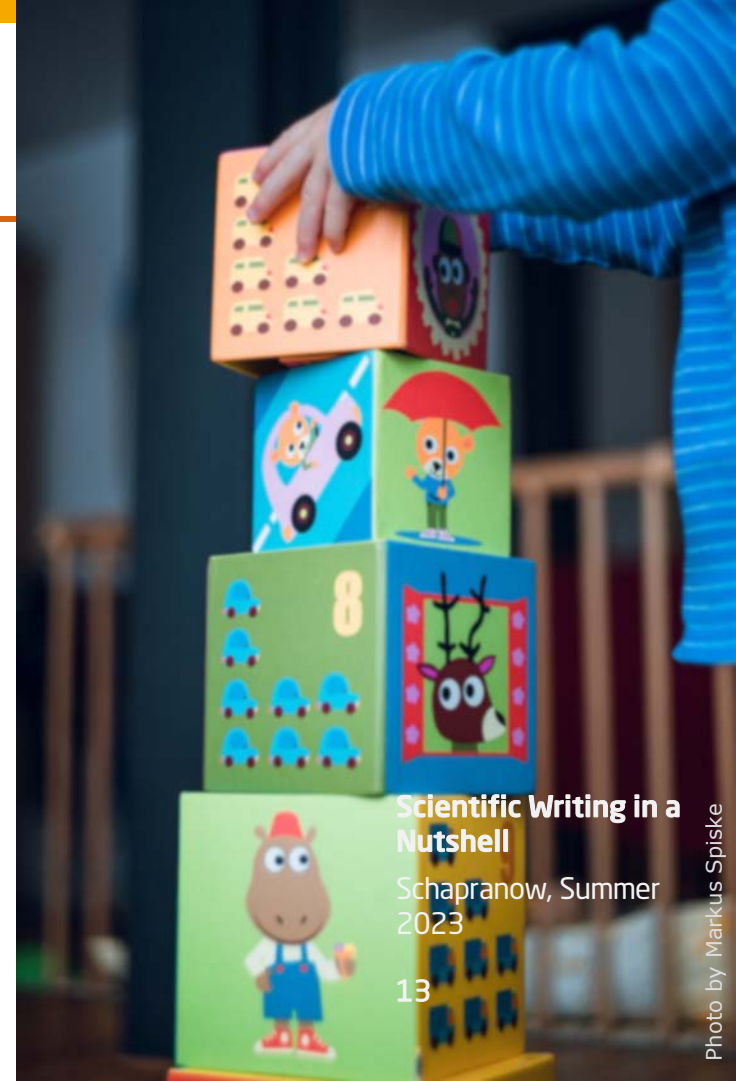
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4. Contribution(s)

- Aim: Share most relevant details of your work
- Describe what you achieved, i.e. results and deliverables
- Highlight your highlights, what is unique, what you want to share with others, what are you proud of
- Please do not describe how you got there, i.e. prevent story-telling: ~~"First, I did this, but it fails, then I tried this. At the end..."~~
- Share detailed insights and not only general sentences
- Distinguish between your work and what you have built upon



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4a. Benchmarks and Results

■ Aim: Compare your work and support reproducibility

- What was the very specific setup you used to obtain your results, e.g. computing infrastructure, measurement devices, precision of clocks or measurement devices, what was measured, how often, etc.
- What metric(s) did you measure and why
- Which parameters were varied and which were kept unchanged (hint: keep most parameters fixed and just change a minimum of parameters at a time)
- What results did you acquire
- Please put interpretations or assessments not here, but in your evaluation

TABLE 1. Simulation results displaying AUROC for the different analysis cohorts and patient outcomes. Abbreviations: IHD = Intermittent Hemodialysis, CRR = Continuous Renal Replacement Therapy, MLP = Multilayer Perceptron, RF = Random Forest, BRL = Bayesian Rule Lists, LR = Logistic Regression, and BRR = Bayesian Ridge Regression, LOS ICU = Length of Stay in the ICU.

Outcome	Complete cohort						Acute patients						IRD patients						CRR patients					
	MLP	RF	BRL	LR	BRR	MLP	RF	BRL	LR	BRR	MLP	RF	BRL	LR	BRR	MLP	RF	BRL	LR	BRR				
90-days mortality	0.84	0.84	0.76	0.71	0.79	0.83	0.85	0.79	0.79	0.81	0.83	0.82	0.79	0.69	0.79	0.77	0.78	0.72	0.66	0.72	0.78			
Renal Recovery	0.81	0.83	0.88	0.77	0.80	0.86	0.83	0.88	0.76	0.78	0.82	0.81	0.79	0.76	0.78	0.80	0.75	0.79	0.76	0.78	0.79			
Variation Days	0.83	0.79	0.71	0.74	0.80	0.64	0.64	0.64	0.68	0.65	0.81	0.74	0.78	0.77	0.79	0.75	0.64	0.79	0.64	0.79	0.64	0.79		
LOS ICU	0.81	0.80	0.82	0.73	0.82	0.78	0.64	0.69	0.61	0.73	0.80	0.82	0.78	0.78	0.80	0.77	0.66	0.78	0.67	0.78	0.67	0.78		

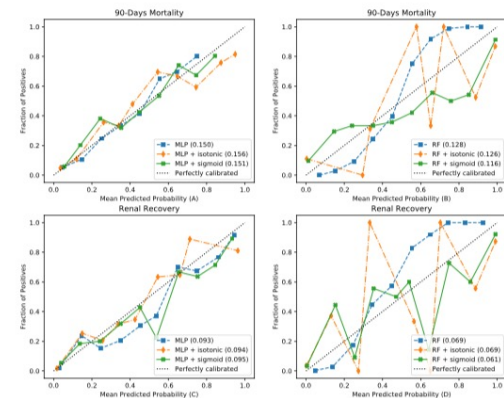


Figure 4. Model calibration depicted for Multilayer Perceptron (MLP) and Random Forest (RF) for the outcomes of 90-days mortality and renal recovery.

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5. Evaluation

- Aim: Help the reader to interpret your findings/observations; focus on your observations!
- "I tried to produce identical eggs, but my results differ in size and color."
- "We measured a mean response time of 110ms with a standard deviation of 15%, which is 10% faster than comparable approaches."
- "We would have expected to double the throughput, but stuck at a factor of 1.5x."



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6. Discussion



- Aim: Discuss your findings, what did the evaluation show, how to proceed with it
- Did your results meet your expectations, yes/no why?
- You might want to explain why you meet/lack behind certain assumption
- What could be possible explanations for your observations/measurements
- What next steps/changes need to be conducted to understand the source for your results
- Do you need to change assumptions, data, parameters, etc.

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7. Conclusion & Outlook

- Conclusion (aim: sum up your findings / main contribution)
 - Help the reader to recall your findings / contributions in a nutshell
 - Stress why and how your contributions extend the current state of the art; why is your work important
- Outlook (aim: guide the reader through your planned next steps)
 - Do you plan certain next steps, experiments
 - How do you plan to proceed your research
 - How will you address issues identified during your evaluation



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Bibliography



- Recommendation: use a bibliography management tool to make your life easier
- Nonetheless (even if you use generated bib entries for existing publications):
 - Check for consistency, e.g. upper- vs. lowercase of titles and journal names (use curly brackets in bib files to lock format "{MySQL}")
 - More than three authors? → First author's name + "et al." (can be achieved by "and others" in bib files)
 - Online references? → Please add URL and "last checked" date; ideally check all online references prior to submission at the same date

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Style of Writing



- Be precise and formal, e.g. "I or we did X and Y to achieve Z."
- Stress statements by appropriate references
- Write about facts and not about opinions or your individual challenges
- The discussion is the right place to share your personal opinion only
- Consider splitting complex sentences in multiple parts
- Please prevent "already mentioned, as state before, again..."
- Use commas when appropriate, e.g.
 - With conjunctions,
 - With most "w-"pronouns,
 - Not before _that_

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What is the Perfect Length?

"I have studied this manuscript very carefully with lemon juice and X-rays and have not detected a single flaw in either design or writing style. I suggest it be published without revision. Clearly it is the most concise manuscript I have ever seen-yet it contains sufficient detail to allow other investigators to replicate Dr. Upper's failure. In comparison with the other manuscripts I get from you containing all that complicated detail, this one was a pleasure to examine. Surely we can find a place for this paper in the Journal-perhaps on the edge of a blank page."

THE UNSUCCESSFUL SELF-TREATMENT OF A CASE OF "WRITER'S BLOCK"¹

DENNIS UPPER

VETERANS ADMINISTRATION HOSPITAL, BROCKTON, MASSACHUSETTS

REFERENCES

¹Portions of this paper were not presented at the 81st Annual American Psychological Association Convention, Montreal, Canada, August 30, 1973. Reprints may be obtained from Dennis Upper, Behavior Therapy Unit, Veterans Administration Hospital, Brockton, Massachusetts 02401.

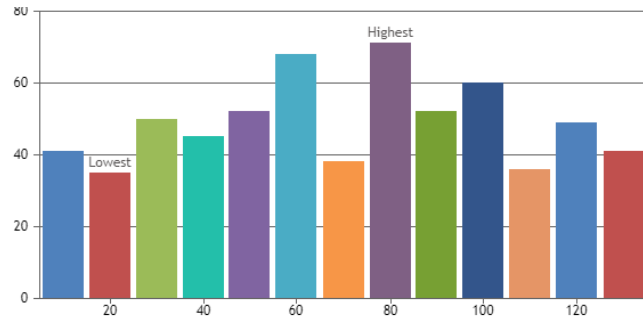
*Received 25 October 1973.
(Published without revision.)*

- Check spelling and grammar repeatedly
- If you find a single word ending on a new line, consider rephrasing the sentence
- Place multiple references together at the end of the line to support readability
- Check if anything - figures, tables or text - reaches into the paper margin
- Place figures either at top or at bottom of a page, prior to referring to them
- Refer to all figures, tables, equations, listings, etc. within the text
- Add an appropriate description to your figures, tables, equations, listings, etc. enabling the reader to understand them even without reading the full text



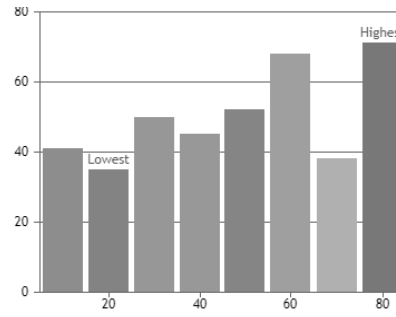
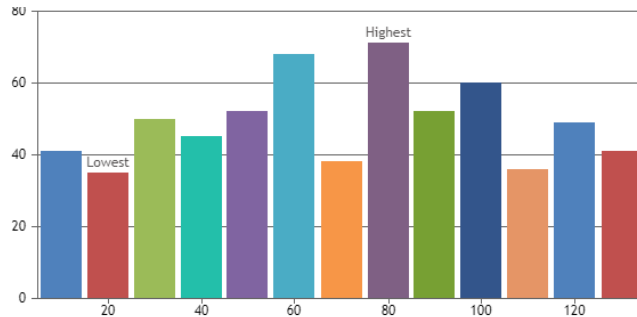
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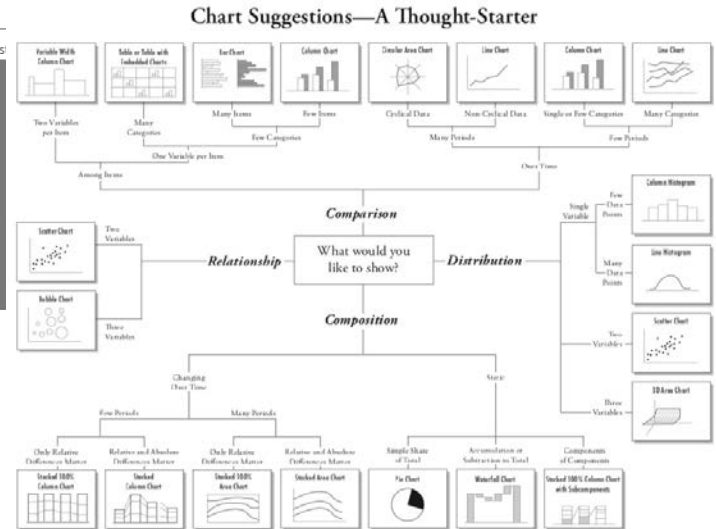


- "A picture is worth a thousand words"
- Creates an long-lasting association in the reader's mind
- A strong form of communicating findings

Figures, Charts, Listings, ...



- "A picture is worth a thousand words"
- Creates an long-lasting association in the reader's mind
- A strong form of communicating findings
- Use visual hatchings to make charts readable even in grayscale printing
- Text in figures should be the same size as the remainder of your document
- Resolution should be adequate for printing, i.e. at least 300dpi



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LaTeX: Tips and Tricks

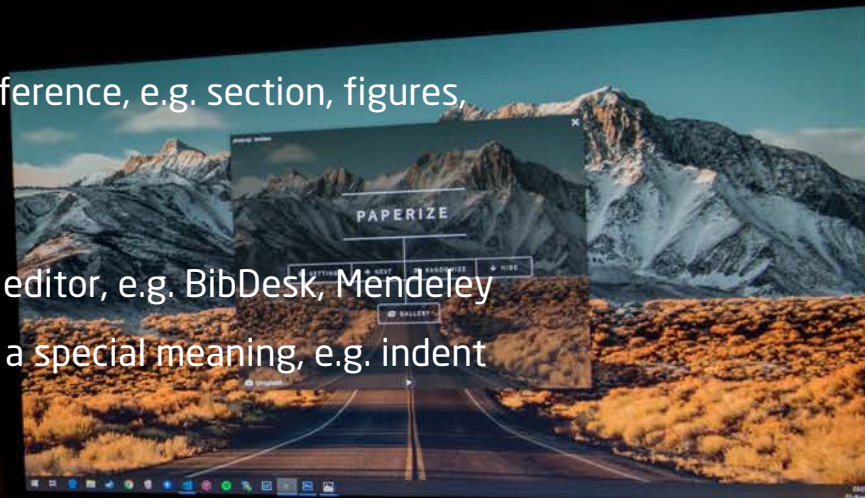


■ Dos

- Introduce `\label{fig:abc}` for anything you want to reference, e.g. section, figures, charts, listings, etc.
- Use `\autoref` or `\cref` instead of `<labelname>~\ref`
- For references, use a .bib file and an appropriate bib editor, e.g. BibDesk, Mendeley
- Check line breaks in latex source because they have a special meaning, e.g. indent

■ Don'ts

- Prevent footnotes, e.g. for URLs; instead add a proper reference
- Prevent manual formatting, e.g. bold or italics, because it is managed by .sty/.cls
- Manual line breaks (`\`) or new pages (`\newpage`)



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Stay in Contact

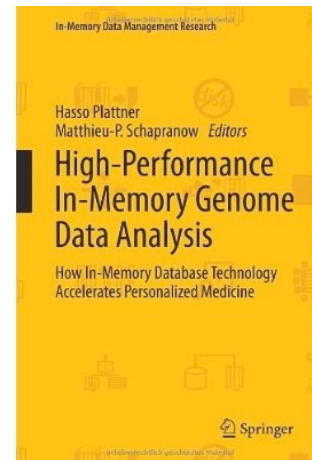


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