

Guidelines for Writing Papers and Reports

Citation for published version (APA):

Borsboom, O. J. T., & Salazar, M. (2023). Guidelines for Writing Papers and Reports. Unpublished.

Document status and date:

Unpublished: 01/01/2023

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

Guidelines for Writing Papers and Reports

Olaf Borsboom and Mauro Salazar

Abstract—The communication of our work to other researchers, students and supervisors is one of the most important aspects of our research, and writing should be given due consideration and attention. This paper presents guidelines and best practices for students on writing reports and papers in an academic two-column IEEE conference format. First, we present the main purposes and layout of a scientific paper: How to clearly state the research questions, explain the methods applied, provide relevant results and data, critically discuss the results and draw the conclusions. Second, we show how to correctly include symbols, equations, figures, tables and captions. Third, we provide several pointers for reader-friendliness, language and the precise application of strict conventions in the academic world, while giving examples of what is appreciated and what is discouraged. We suggest students to carefully go through this document in the early stages of their projects, before they start writing their reports.

Index Terms—Academic writing.

I. FOREWORD

SCIENTIFIC papers are the most important textual communication tool in the academic world. Well written, they serve as a concise and clear means of expressing ideas, methods and findings in research. Papers are usually written for an expert audience and do not provide a chronological summary of events or steps, but rather contain a message that the authors want to impart, to which they supply the necessary evidence. Moreover, they can help the researcher organize, structure and define ideas and activities. Also for students who do not pursue an academic career, the ability to write accurate, reader-friendly documentation can significantly improve efficiency and effectiveness for knowledge transfer in industry.

Even within such a traditional area as the academic world, there are some aspects where the author’s choices can cause a difference in writing style. Since conveying our point in a clear, concise and reader-friendly fashion is the most important feature of a paper (and more important than tradition, in our view), we choose to write our papers in *active* form, namely from the *academic* “we”-perspective, rather than constructing complicated sentences in the Passive Voice, and we need to accept a few basic formal language rules, condensed in Section III-B dedicated to Language.

This “paper” is intended to provide students with clear guidelines on how to properly structure their papers and write them in an adequate formal and reader-friendly style. This can be a paper for a course in the Control Systems Technology (CST) section, to finalize their Bachelor End Project (BEP), an Internship Project (IP) or a Master’s thesis (MT), or a contribution to a conference or journal. The paper at hand shall

The authors are with the Control Systems Technology section, Eindhoven University of Technology (TU/e), Eindhoven, MB 5600, The Netherlands. E-mail: {o.j.t.borsboom, m.r.u.salazar}@tue.nl

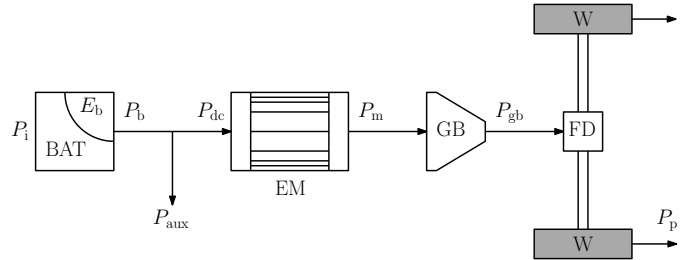


Fig. 1. An example of a cover figure, showing the powertrain configuration that we could be considering.

serve as an example of such a scientific document in terms of structure, layout, language, derivations and visual aids. It also provides specific examples of what is “*recommended*” and what is “*discouraged*”.

In general, all scientific papers have the same structure. The Introduction describes the context of the research, states research questions and the contribution of the paper (“Why do we do what we do?”). Then follows the Methodology (“How do we do it?”) with a brief discussion of the assumptions and potential simplifications. Afterwards, the results are shown (“What can we achieve with the devised methods?”) and the conclusions are drawn (“What do the results tell us? What did we learn?”).

Disclaimer: The following writing guidelines are offered as insights and recommendations based on the personal experiences and opinions of their authors. They are not intended to be considered universal truths or definitive rules. Writing is a highly subjective and evolving craft, and what works for one person may not work for another. These guidelines should be used as a source of inspiration and guidance, but writers are encouraged to explore, experiment, and adapt their approach to suit their unique style and objectives. Ultimately, the art of writing is deeply personal, and the path to mastery is paved with individual exploration and discovery.¹

II. INTRODUCTION

In the first section of our paper, the Introduction, we set the stage for our research, review literature, spark the interest of our readers, and try to create an urgency to continue and finish reading the paper. It is the literary equivalent to the salesman’s “foot in the door” and should answer the following five questions [1]: Why is the topic of interest? What is the background on the previous solutions, if any? What is the

¹Given the latest developments in text-based AI language models, we decided to test ChatGPT to generate this short disclaimer. Thereby, we remind the writer that ChatGPT and similar tools can assist, but they do not replace our unique creative input. Use them for support, but your voice and authenticity should shine through in your writing.¹

background on potential solutions? What was attempted in the present effort (research project)? What will be presented in this paper? To this end, our introductions typically have four parts.

- 1) *Background and problem.* In this part, we establish the background to the problem, showing its relevance, and define the research problem tackled.
- 2) *Related literature:* This is where we review previous research that is relevant to our contribution. We also arrive at a preliminary conclusion, pointing out the gaps in the state-of-the-art.
- 3) *Statement of contributions:* We fill the gap in the literature and outline the contributions of the paper. This is where we must give “spoilers” to the reader about what we are going to present.
- 4) *Organization* – We sketch out the individual chapters of our paper and briefly state what they contribute to the message we want to convey.

In the problem background paragraphs, we should adhere to a funnel structure: Start out broad and converge to a niche. However, starting out broad does not mean that every paper on powertrain design optimization has to begin with general statements on the Paris Agreement, environmental issues, climate change, etc., and the effects of transport on these controversial issues. We can rather pinpoint the electrification of vehicles and the challenges that come with their design. In the end, we also briefly state the research aim, which is instrumental as it sets the stage for the literature review.

Related literature: A literature review should be the basis of our work. The main idea of pursuing research is to identify a knowledge gap within the literature, in a niche of our research field (find something that has not yet been explored) and fill that gap [2]. At the same time, the literature can act—as Google Scholar puts it nicely—as the shoulders of the giants we stand upon. Without previous research, we would have to define and develop methods from scratch, each time. Therefore it is extremely important to give credit to any ideas that were not our own. Even if our paper is more practical and project-based and less research-oriented, it is of paramount importance to take this standpoint and review the literature that is related to our subject. In a *Related literature* section, we try to structure and group the previous research based on methods or applications [3]–[5]², instead of delivering a disordered list of references. Additionally, if we present any models or ideas that were not ours in later sections of the paper, we still cite them whenever necessary [6].

Specifically, we start by first defining the research lines. For instance, *“This paper pertains to two research streams: racing and electric powertrain design.”* We write one paragraph per research line, at which end it is important to highlight what is missing in that particular line to solve the problem we stated right before this subsection. It is important to finish our literature review with a clear statement regarding potential challenges that have not yet been addressed. The issue of how we plan to solve this problem will be presented in

the *Statement of contributions* section below. For instance, *“In conclusion, to the best of the authors’ knowledge, the challenge of jointly optimizing the design and control of the full powertrain to minimize the lap time of a battery electric race car in a computationally-efficient manner and with global optimality guarantees has not been addressed yet.”*

Statement of contributions: In this subsection, we state how our paper is filling the research gap identified in literature. We can start with a broad statement, and then define the individual contributions of the paper. Addressing the gap presented above, we could write: *“To address this challenge, this paper presents a computationally-efficient optimization framework for battery electric race cars equipped with two types of transmissions, namely, an FGT or a CVT. In order to achieve this, we first derive a convex model of the powertrain. Second, we formulate the minimum-lap-time control problem and solve it via second-order conic programming. Third, we showcase our convex framework with case studies comparing (...).”*

Organization: This very short subsection briefly tells the reader what to expect in the remainder of the paper in terms of content. As an example, *“The remainder of this paper is structured as follows: Section II presents the convex powertrain component modeling methods and the minimum-lap-time control problem. Section III presents numerical results and design studies for both an FGT and a CVT-equipped powertrain on the Le Mans track. Conclusions are drawn in Section IV, together with an outlook on future research.”*

III. GENERAL GUIDELINES

In general, it is always helpful to start a section with a statement on its content. In this case, we could write: *“In this section, we offer several guidelines on writing that are not directly related to a specific section of a paper. We treat subjects regarding reader-friendliness, language, page limits, title, abstract, etc.”*

A. Reader-friendliness

Often, students and researchers view scientific papers merely as a means to write up their scientific-technological findings in a compact way in order to communicate with other experts in the field, writing monotone sentences and intersperse them with complex words, seeking complicated formulations instead of focusing on clear content. Yet papers nowadays often have an interdisciplinary focus, adopting approaches from and reaching out to researchers from related fields or more distantly related disciplines, or to students who have just started their literature study on our subject: plenty of reason, therefore, to write our papers more reader-friendly, and to also address readers with a wider scope of interests. One way of making our text more reader-friendly, is by giving the reader *spoilers* beforehand on the subject matter that we are about to treat: *Repetita iuvant*. It can be tempting to add a certain type of tension or mystery to our texts, but this will not enhance the readability of our papers. We have to keep in mind that we know our subject inside out, but it is most likely that a reader encounters our work for the first

²The easiest way of learning is by imitation: The referred papers were published by our research section and can serve as examples.

time. Therefore, in order to convey our message as clearly as possible, it is important to remind the readers and ourselves every now and then of the goal and purpose of our research, and announce how the upcoming section contributes to it. This is called a thread, a *fil rouge* or, in Dutch, *rode draad*. The best opportunity to do so is usually at the beginning of each section and subsection.

Additionally, students are often afraid of word repetition (because it might come across as *lazy writing*) and will use numerous synonyms, but this will not always enhance the readability of our papers. It is good to avoid using the same linkers dozens of times in our papers, such as “However”, “Specifically”, or “Additionally”. While it is recommended to find synonyms, useful verb-noun collocations or alternative formulations in those situations, is it not at all harmful to use the same word for complex concepts throughout the text. For example, it can be confusing to the reader if you call the same optimization method a “framework”, an “algorithm”, a “scheme”, an “approach”, a “tool” and a “program” in one paper. Moreover, repeating words can help us to guide the reader from one sentence to the next, through complicated derivations and arguments.

Finally, to ensure that our readers understand our acronyms, we must limit them in number (for instance five) and only introduce them for concepts that we will really use repeatedly. Besides that, we must define an acronym in the Abstract as well as in the main body and in the Conclusions.

B. Language

There are plenty of books and articles written on Academic English writing, and the document at hand is not intended as a replacement for or an extension to that material [2]. However, we would like to make four additional points regarding the language used in our papers. First, we should avoid being vague or ambiguous in our formulations at all times. Vagueness can be avoided by being specific, e.g., “*the computation time included 7s of parsing and 1s of solving*” instead of “*the algorithm is very fast*”. Ambiguity can be avoided by using the correct linguistic structure and punctuation. Second, it is obvious that our papers should not contain spelling or grammar errors. Often students hand in a first version of their reports that has not been thoroughly proofread, which makes our supervisors spend more time on correcting faults and errors, instead of focusing on the actual content of the paper. Therefore, in order to benefit as much as possible from the iterations with our supervisors, we have to ensure that the quality of our paper is high. To this end, it is always good to reread a paper the next day and to ask a colleague for their opinion on it. Third, we adopt a formal (as opposed to colloquial) writing style: Contractions such as “*don’t*” (“*do not*”) and “*won’t*” (“*will not*”) must be avoided, the confusion between “*it’s*” (“*it is*”) and “*its*” (possessive pronoun), likewise. The same goes for correct punctuation, as it can have an influence on the interpretation of our sentences. Fourth, we can be creative in choosing verbs that go well with certain nouns, or the other way around. These combinations are called *verb-noun collocations*, and varying

them will always advance the readability of our work; varying between noun and verb structures likewise. An example of the latter: “*...after (the) implementation of our methods...*” arguably reads better than “*...after we have implemented our methods...*” A wide range of examples of useful noun-verb, and verb-adverb-verb collocations can be found in the *LTP Dictionary of Selected Collocations* [7].

C. Sections

Only the Abstract, Introduction, Conclusions and References are fixed sections. It is not necessary to integrate Methods and Results in the headlines of sections (e.g., headlines like “Models” or “Case Studies” also make sense). It is also possible that multiple methods are presented in the paper, and it is justified to first introduce one method and its results, before moving on to the next method. All in all, it is most important that the structure of the paper is logical and that these elements are clearly recognizable.

D. Title

The first decision whether a paper is of any interest to read or to attend its presentation at a conference is based on the title. The title should spark attention, be descriptive and to the point, and should not be longer than two lines. At the same time, a title should not be too short or vague. The common mistake of choosing a title that is too broad might misguide and disappoint the reader.

E. Abstract

The purpose of the Abstract is to attract readers, provide sufficient information to raise their curiosity and make them download and read the paper. It should summarize the essential elements of the paper and highlight the most important findings. This is where it differs from a trailer for a movie—we already spoil the reader with how our paper is going to end. In many papers, the abstract begins with the phrase “*This paper concerns...*” or “*This paper presents...*”. Thereafter, we can list the specific contributions—enumerating them to enhance reader-friendliness: “*In particular, we first identify a convex model of the powertrain that accounts for the thermal dynamics of the electric motor. Second, we leverage our model to frame the minimum-lap-time control problem as a second-order conic program that can be efficiently solved with global optimality guarantees. ...*” Finally, we can provide a teaser on the most important results: “*Our results show that equipping the race car with a multi-gear transmission can improve lap time by 2%.*” In this way, we come right to the point and the Abstract is kept short and focused. Hereby, we must avoid literally repeating the title in the first sentence of the Abstract.

At the top of the second column on the first page, we can also include a figure that can spark the reader’s interest, like Fig. 1. If we choose and design our cover figure well, it can act as a *visual abstract* that provides more information than we are able to provide in written form. Therefore, the cover figure deserves a reasonable amount of effort and attention. In both cases, we must make sure to refer to the figure in the main text.

F. Style Sheets and Page Limits

The use of \LaTeX simplifies the writing of the paper, as most aspects related to layout and references are executed automatically. In our lab, the use of TexStudio with GitLab is encouraged, but when cooperating with other students, Overleaf can be an option as well, though it can bring some difficulties in co-creating a bibliography. As stated before, we also adhere to the IEEE two-column style in our student reports, which can easily be implemented by including `IEEEconf.cls` in the `\documentclass` command.

The academic world is a conservative one filled with traditions and standards. Before the age of globalization, the peer review system required papers to be sent across the world numerous times, and to reduce dispatch costs, it is reasonable to cut the number of pages per paper. The emergence of the Internet has, of course, eased (international) communication and the distribution of these documents, so strictly speaking, this is not a valid reason for these page limits anymore. In addition, to increase the reader-friendliness of our papers and reduce the *cognitive load per page* for the readers, it might make sense to introduce more intermediate steps of derivations, explanatory examples, and informative figures [8].

Nevertheless, page limits still exist, and we must strictly adhere to the page limit that is given to us, for several reasons. First, it is not only disrespectful to the supervisors and hypothetical editors, reviewers and publishers to break this limit, it is also a good exercise in writing concisely and to the point—while still remaining comprehensible for students and other less experienced readers. Moreover, supervisors are typically not looking forward to reading and reviewing a document that is forty pages or longer (the same applies to managers and superiors in industry), and it is uncertain whether students are looking forward to writing such a document. Finally, if the research is interesting enough (mostly an MT), there is a good chance of submitting it to a conference, in which case it would not need so much rewriting.

Often students think that they are not able to shrink their report (or presentation) any further than the amount of pages (or slides) they currently have. This is untrue by default. The message of any research can be conveyed in 6 pages (or 15 minutes), but the researchers will have to make choices in what to present, whilst moving additional material to the appendix or backup slides that could be useful when discussing their work with peers and supervisors. In doing so, remember that *less is more*.

G. Planning

It goes without saying that students, as well as any researcher, should start writing well in time before their deadline, since scientific writing is no exception to the 80/20 rule: 80% of the time goes into the last 20% of the work. Another rule that is applicable to writing is the π -rule. This entails that whatever time we think we need for a certain task, we should multiply that amount by 3.14 in order to get a realistic estimation. The main structure of our paper will be written relatively fast, but polishing text, figures and correcting typos

in order to achieve a high quality paper, is a time-consuming task, or as the proverb goes: *The devil is in the details*.

IV. METHODOLOGY

In this section, we discuss what a Methodology section should contribute to our paper, as well as guidelines on elements that we often use when presenting our methods, namely, equations (including symbols) and problem statements.

In the Methodology section, we present the way the research is carried out. In technical papers, the Methodology section discusses mathematical models, optimization methods, designs, experimental setups and measurement procedures. It should follow a logical order that devises the methods from scratch and not the order in which we chronologically executed our research. In many papers, the Methodology sections are the largest part of the paper. The methods themselves should be rigorous and should be described in such way that they are reproducible by other scientists in the field. We state assumptions clearly and comment on them in a Discussion subsection, which is typically the last subsection of the Methodology section in our papers. It is important to note that the Methodology section does not contain *any* numerical value, but these are parameterized with symbolic variables. We only turn to numerical values in the Results section, or when it is inherent to the equation itself, for instance in the definition of kinetic energy ($E_{\text{kin}} = \frac{1}{2} \cdot m \cdot v^2$). However, the Methodology section can be used to show intermediate results that are necessary to provide, for instance, the fitting error of our models, before we can move on to the next part.

A. Equations

A significant part of a scientific paper can consist of models, hence equations. The Dutch word “formule” is more elegantly translated as equation. While the word formula is not completely wrong as a translation, it has connotations with racing and recipes or lists of ingredients related to chemistry. Special rules apply to the use of equations in papers and they are explained below, together with examples.

- A model has to be reproducible and there must not be any doubt regarding the used symbols. Therefore, every symbol is introduced directly after its first use. Even the earth’s gravitational constant g , the density of air ρ and the velocity v are introduced in every automotive paper, up to the time t . However, we usually do not introduce mathematical operators such as the gradient (∇).
- An equation is written as a part of a sentence. It is therefore also accompanied by either a comma or a period. Examples: *“The aerodynamic drag force F_a is equal to*

$$F_a(t) = \frac{1}{2} \cdot \rho \cdot c_d \cdot A_f \cdot v(t)^2, \quad (1)$$

where ρ is the density of air; c_d is the drag coefficient, A_f is the frontal area of the vehicle v is the velocity, and t is the time. In some papers, the constant k_d is introduced as”

$$k_d = c_d \cdot A_f. \quad (2)$$

- We use \cdot as a multiplication sign, as we can see in (1) and (2), which is implemented by the command `\cdot`. We do not use \times (if it is not a cross product) or $*$ for multiplication. The Kronecker product (“ \otimes ”) is written with `\otimes`. We typically write divisions with the command `\frac{num}{den}`.
- As mentioned at the beginning of this section, in general we do not use numerical values in our method section, as the models may hold also with other parametrizations. The following is an example of what is not appreciated: *“Considering that we fix the efficiency of the gearbox $\eta_{gb} = 97\%$, the requested motor power is equal to”*

$$P_m = \frac{P_{gb}}{\eta_{gb}} = \frac{P_{gb}}{0.97}. \quad (3)$$

Note that when we actually want to express a numerical value with dimensions, we use the LaTeX command `\unit[value]{dimension}`, where we always use SI units for any value. If necessary, we also adopt SI metric prefixes, so we write **3 MJ** instead of $3 \cdot 10^6 \text{ J}$ or **3MJ**.

- We follow the convention that we write variables in italics, but abbreviations in the subscripts in standard type (also called non-italic or Roman). For instance, the power output of the motor is a variable, but the subscript m is merely an abbreviation indicating that it is related to the motor. Also, italic variable m could already be representing a mass. Thus, we write the motor power not as “ P_m ” (`\mathit{P}_m`), but as “ P_m ” (`\mathit{P}_{\mathrm{m}}`), where `\mathrm{}` comes from “math-Roman”). However, we naturally have cases where the subscript is a variable and should be set in italics. To give an example: *“The gear ratios are indicated by g_i , where $i \in [1, n_{\text{gears}}]$ and n_{gears} is the number of gears”*.
- We refer to equations by the command `\eqref{}`, with a tilde (\sim) in front of it and without spaces. The following is an example of “a reference to (1)”: a reference to `\sim\eqref{eq:Fa}`. Moreover, we can *only* refer back to an equation *after* we have introduced it.
- We refer to equations by its number between brackets only and usually do not include the word “equation” before the reference, except at the beginning of a sentence: *“Equation (2) is...”*. For the same reasons, we avoid starting a sentence with a variable.
- The following piece is an example of how students often write equations, but it is in fact wrong in the aspects we have just introduced: *“The kinetic energy is given in equation (4).”*

$$E_{kin} = \frac{1}{2}m_v v^2 \quad (4)$$

That is to say, the equation is not a part of the sentence, we wrongly include the word “equation”, we excluded the correct multiplication sign, we cannot distinguish variables from abbreviations in the subscripts, and we refer to it before we have introduced it.

B. Problems

After we have constructed our model with well written equations and presented the constraints with the necessary derivations, we can summarize our optimization problems using the Problem environment with the `amsthm` package in LaTeX. We need to create the environment using the command `\newtheorem{prob}[thm]{Problem}` before we write the `\begin{document}` command. A simple example for a summarizing problem is given as follows:

Problem 1 (Problem). The optimal control strategies are the solution of

$$\begin{aligned} \min \quad & J \\ \text{s.t.} \quad & P_1 \geq 0 \\ & (1) - (4). \end{aligned}$$

The problem is written using the code given in Appendix A. A smart way of compactly writing an optimization problem and its constraints is by referencing equations that were previously introduced in the paper. However, not all equations might contribute to the optimization problem, so we have to be careful which equations will be numbered (and for which it might be unnecessary), and which equations we reference in the optimization problem statement.

C. Discussion

In a Discussion section, we present the assumptions and limitations that our presented methods might have. We do not provide reasons, excuses, or apologies for potential shortcomings, but we try to turn the framing around. In this way, we do not weaken our work, but rather strengthen it.

For example, we can write: *“A few comments are in order. First of all, we scale the electric motor by scaling the efficiency and the mass linearly in the maximum torque. This scaling is in line with high-level modeling approaches and optimal sizing design problems. More detailed scaling methods will be investigated in future research.”*

This sounds scientifically more reinforcing than *“Unfortunately, we did not have sufficient data to also include more accurate electric motor scaling methods. If we would have had more time to finalize the project, we could have investigated this in more detail.”*

This is academically invalid, sounds apologetic and is no excuse for a journal or conference paper. Instead, we want to highlight our findings and assumptions and justify them, so that readers are aware where our results are coming from in terms of models’ accuracy and assumptions.

We have to keep in mind that each paper should have its contribution, and we do not have to focus on specific details that would have been better to include, but are not supporting our contribution. A Discussion section should reinforce our work, because we acknowledge the limitations of it and explain why they are acceptable. Moreover, we can name the limitations before another researcher or one of our committee members can reproach us for missing details.

Some authors prefer to write the Discussion section in the Results, which is also perfectly acceptable. We choose to write it in the Methodology, to give the reader some *disclaimers*

on the underlying modeling assumptions and their validity—sometimes including how to improve them—before we present our results to the reader.

V. RESULTS

In this section, we first elaborate on what the contribution of the Results is in our paper. Thereafter, we present guidelines on displaying results in their most frequent visual forms: figures and tables.

We obtain results after the implementation of our methods and we typically present our results through figures, tables and text. Moreover, the Results section should highlight the findings of the paper. It often happens that much more data is available than can be published in the paper, especially in conference papers, and BEP and IP reports, where space (or time, in presentations) is very limited. Therefore, we have to carefully select the results such that our research questions can be answered, we can convey a clear take-home message, and conclusions can be drawn. This is not easy—it is an art in itself, in fact—and we should put a lot of effort into constructing our Results section.

To help selecting and polishing results, we need to ask ourselves “What is the story we want to tell? What is the take-home message?”. What is more, the figures in the Results section are one of the first things other researchers look at, after reading the Abstract, when they review the literature of a specific research field. That is why figures need to be carefully selected and aesthetically pleasing, a feature that will be discussed in Section V-A below.

Occasionally, the results at the end of a project or thesis are not as expected or desired. Needless to say, however, intellectual honesty and integrity are the most important properties of a researcher, and fabrication or manipulation of data is a scientific misconduct that is never tolerated.

A. Figures

As the phrase goes, *a picture says more than a thousand words*, we need to ensure our figures tell the right ones. Therefore, we have to be consistent in our presentation and put a significant amount of effort into creating figures and equations, something that most students underestimate. Thus it is advisable to make our code produce clean and clear figures as early as possible in our research project. Furthermore, when creating our figures, we have to keep in mind that we could be presenting those figures on slides in a future presentation.

As mentioned before, most people reading or reviewing a paper will first look at the figures. Although the text of a paper is the most essential, the figures immediately reveal the subject and can quickly clarify an issue that is hard to describe in words. Moreover, figures can capture content from all sections, such as models, designs, simulations or measurements. As our paper should not only push significant research but should also be pleasant to read, it is important to put effort in creating aesthetically pleasing figures that are consistent with the paper layout and to also pay some attention to attractive and readable colors, nice linestyles and markers, and so on. It is also a good signal to our reader, supervisor or reviewer, conveying

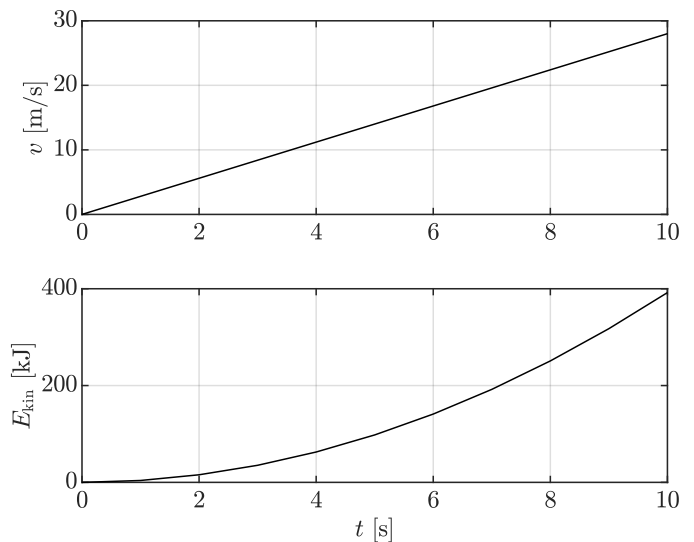


Fig. 2. The increase of kinetic energy when a vehicle of 1000 kg is constantly accelerating from 0 to 28 m/s.

that we carefully executed our work and care about providing them with a pleasant reading experience. For that reason, if simulation tools like Simulink are used in our research, we redraw the diagrams of the created model and do not use a screenshot of the Simulink model. To redraw block diagrams, we can use tools like TikZ, draw.io, IPE, or similar.

Figures are placed automatically in the text by LaTeX. They should be at the top of columns and the first figure may only appear in the second column of the first page. To this end, we use the command `\begin{figure}[t]`. When referring to a figure, we always use the figure number as `Fig.~\ref{fig:x}`, i.e., “*Fig. 1 shows*” and not “*In the next figure*” or “*In the figure below*”. Moreover, the citations always carry the abbreviation “Fig.”, even when it begins a sentence.

Every figure has a caption that is placed right underneath the figure. A caption can be read independently from the text and should provide some necessary clarifications and conditions, such that a reader should not have to search in the text what we are presenting in the figure. The discussion of the figure should be in the main text and not in the caption.

Fig. 2 shows a simple example of a figure, describing the relation between velocity and kinetic energy. We will now go into some more rules on figures and graphs.

- Chances are high that TU/e students use Matlab for their models and calculations, and it is advised to use Matlab for plotting as well. In case the models are written in Python, the library Matplotlib can be used.
- Any figure that we include in our paper has to be in vector format, i.e., we have to be able to zoom into it infinitely without the figure pixelating. Typically, we use .pdf files, but a wide range of other file types will work, such as .emf, .eps, and so on.
- As the column width of a paper is approximately 8.9 cm, the Matlab figure needs to be scaled. Scaling is carried out in the File menu of the figure, namely in File>Export Setup. When the width is changed to 8.9 cm and the

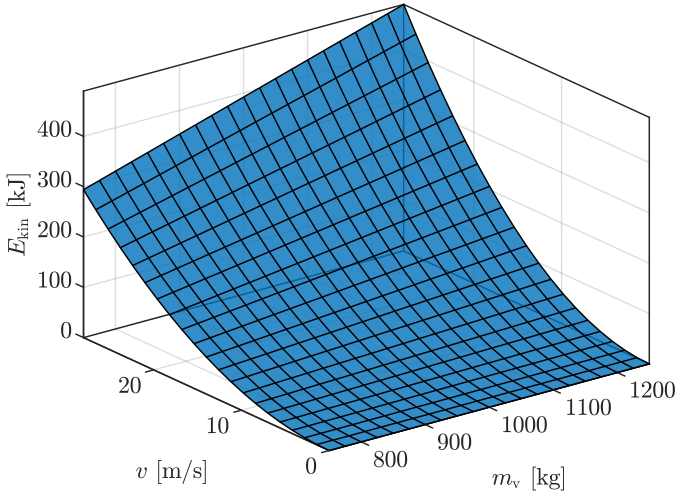


Fig. 3. The kinetic energy of a vehicle with its mass varying from 750 to 1250 kg and its velocity varying from 0 to 28 m/s.

settings are applied to the figure, the figure will scale while the fonts will be kept at a readable font size.

- It can happen that 3D figures like Fig. 3, created with either `plot3`, `surf` or `mesh`, are still saved in a low quality. In that case, we set the “Custom renderer” option to “painters” in the Matlab figure Export Setup>Rendering.
- To make sure that our figures match the rest of the text in our paper, we set the ‘Interpreter’ option to ‘Latex’ for legends, axis labels, axis ticks, and possibly titles (although they are hardly used in figures since we already have captions). Again, we use `\mathrm{}` for the subscripts when applicable.
- In case we want to show multiple signals with different units, for instance, a speed and an energy as a function of time, we use subplots. As can be observed in Fig. 2, we can omit the x-axis label on the upper subplot. The same can be applied to the right y-axis label if the subplots are placed side by side. It is not advised to display two lines in one chart with two y-axes, since such charts are not intuitive to comprehend for readers.
- We have to make sure our figures are provided with a box around it and a grid. We do this with the commands `box on` and `grid on`, respectively. We must also check that our axis limits are equal to the range of the data so that the plot extends to the edges of the axes. In this way we exploit every square centimeter of paper that we are allowed to use.

The code that produces Fig. 2 in Matlab is given in Appendix B. The code that includes Fig. 2 in LaTeX is given in Appendix C.

B. Tables

Besides figures, tables are a good way to present data. For example, dimensions of designs, vehicle parameters and simulation results can be summarized in a compact way. Contrary to a figure, the caption of a table is placed above the text. Tables are placed in the text in a similar way as figures,

TABLE I
VEHICLE PARAMETERS

Symbol	Variable	Value	Unit
$m_{v,0}$	Nominal vehicle mass	1250	kg
r_w	Wheel radius	0.6996/2	m
c_d	Air drag coefficient	0.29	-
A_f	Frontal area	2.38	m ²
c_{rr}	Rolling resistance coefficient	0.0174	-
r_{brk}	Regenerative braking fraction	0.6	-

TABLE II
DIMENSIONS

Symbol	Variable	Value	Unit
x	Width	1	m
y	Depth	1	m
z	Height	1	m

namely at the top (or bottom) of columns and not halfway down a column. Tables are not used to introduce variables, they should be introduced separately in the text. An example of a table with parameters is given in Table I. Data should be presented once, either in a figure or in a table. The code that produces Table II is given in Appendix D.

VI. CONCLUSION

In the Conclusions, we discuss the most important outcomes of our work, the interpretations that can be drawn from the research and answer the research questions stated in the Introduction of the paper (Section II). All conclusions in the paper should be sufficiently supported by evidence and we cannot procure any new evidence or information in the Conclusions section. We should not simply summarize the points already made in the main body—instead, we have to interpret our findings at a higher level of abstraction. The Conclusions section should not focus on ourselves, but on our readers, what our findings mean to them, and provide them with an interesting take-home message.

In the second part of the Conclusions, we mention an outlook on applications of the results in a broader context or give recommendations for future research. However, whatever we suggest as future research has to significantly broaden or extend the work presented in the paper. If done well, we can publish an extension of a conference paper to a journal (this is called a journal extension).

All papers that are submitted, either by BEP, IP, MT or even PhD students, are reviewed in a similar way. Naturally, there is a difference between the levels of complexity of the subjects treated in the paper. However, all papers that are submitted to our supervisors, graduation committee members or conference reviewers should aim at the same writing quality standards. This allows our supervisors to focus on the technical-research aspects of our papers, also in preliminary versions, and signals that we *care* about the reader we address.

To sum up, with this paper, we aspire to help students to raise the quality of their writing (reports, theses, papers) to enable the reader to delve into the scientific-technical subject matter more effectively and with more interest and enthusiasm. Naturally, this document is not the only truth for writing

technical papers, but rather provides a guide for writing them clearly and succinctly, in a manner that we are convinced of.

ACKNOWLEDGMENT

We are deeply grateful to Dr. I. New for proofreading this paper and countless papers and documents prior to this, teaching the authors something new every time. Moreover, this paper draws inspiration from "Requirements for the paper of 5EWA0" by Dr. Ir. J.W. Jansen for the TU/e course Electromechanics, which has taught the first author a great amount on writing scientific papers. Finally, we are grateful to all our co-authors, who taught us a great deal in every collaboration.

APPENDIX A PROBLEM STATEMENT LATEX CODE

The code that produces the example problem statement in LaTeX is as follows:

```
\begin{prob}[Problem]\label{prob:main}
The optimal control strategies
are the solution of
\begin{equation*}
\begin{aligned}
&\! \min & \&J \\
&\text{normal}\{s.t. \} & \&P_1 \geq 0 \\
&\& \eqref{eq:Fa} - \eqref{eq:Ekin}.
\end{aligned}
\end{equation*}
\end{prob}
```

APPENDIX B MATLAB CODE

The Matlab code that produces the example Fig. 2 is as follows:

```
t = linspace(0,10,11);
m = 1000;
v = linspace(0,28,11);
Ekin = 0.5*m*v.^2;
figure
subplot(2,1,1)
plot(t,v,'k'); grid on; box on;
ylabel('$v$ [m/s]',...
'Interpreter','Latex')
set(gca,'TickLabelInterpreter','Latex')
subplot(2,1,2)
plot(t,Ekin/1e3,'k'); grid on; box on;
ylabel('$E_{\mathrm{kin}}$ [kJ]',...
'Interpreter','Latex')
xlabel('$t$ [s]', 'Interpreter','Latex')
set(gca,'TickLabelInterpreter','Latex')
```

APPENDIX C LATEX FIGURE CODE

The LaTeX code that includes the Matlab figure of Appendix B is given below:

```
\begin{figure}[]
\centering
\includegraphics[width=\columnwidth]...
{images/examplefigure.pdf}
\caption{The increase of kinetic energy...
when a vehicle of \unit[1000]{kg} is ...
accelerating from 0 to \unit[28]{m/s}.)}
\label{fig:example}
\end{figure}
```

APPENDIX D LATEX TABLE CODE

The LaTeX code that produces Table I is as follows:

```
\begin{table}[]
\centering
\caption{Dimensions}
\label{tab:params}
\begin{tabular}{l|l|l|l}
Symbol & Variable & Value & Unit \\ \hline
 $x$  & Width & 1 & \unit{m} \\
 $y$  & Depth & 1 & \unit{m} \\
 $z$  & Height & 1 & \unit{m}
\end{tabular}
\end{table}
```

REFERENCES

- [1] E. P. Papadakis, "Why and what for (four): The basis for writing a good introduction," *Materials Evaluation*, vol. 41, pp. 20–21, 1983.
- [2] J. Swales and C. Feak, *Academic Writing for Graduate Students: Essential Tasks and Skills*, 3rd ed. The Univ. of Michigan Press, 2012.
- [3] O. Borsboom, C. A. Fahdzyana, T. Hofman, and M. Salazar, "A convex optimization framework for minimum lap time design and control of electric race cars," *IEEE Transactions on Vehicular Technology*, vol. 70, no. 9, pp. 8478–8489, 2021.
- [4] O. Borsboom, C. A. Fahdzyana, M. Salazar, and T. Hofman, "Time-optimal control strategies for electric race cars for different transmission technologies," in *IEEE Vehicle Power and Propulsion Conference*, 2020.
- [5] A. Locatello, M. Konda, O. Borsboom, T. Hofman, and M. Salazar, "Time-optimal control of electric race cars under thermal constraints," in *European Control Conference*, 2021.
- [6] O. Korzilius, O. Borsboom, T. Hofman, and M. Salazar, "Optimal design of electric micromobility vehicles," in *Proc. IEEE Int. Conf. on Intelligent Transportation Systems*, 2021, in press. Extended version available at <https://arxiv.org/abs/2104.10155>.
- [7] J. Hill and M. Lewis, *LTP Dictionary of Selected Collocations*, 1st ed., 1997.
- [8] H. Bijl, "Gaussian process regression techniques with applications to wind turbines: A student version of the thesis," Ph.D. dissertation, Delft Univ. of Technology, 2018.