

Example and documentation of the `kaobook` class

The kaobook class

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Example and documentation of the kaobook class

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Federico Marotta *

March 3, 2019

An Awesome Publisher

* A L^AT_EX lover

The harmony of the world is made manifest in Form and Number, and the heart and soul and all the poetry of Natural Philosophy are embodied in the concept of mathematical beauty.

– D'Arcy Wentworth Thompson

Preface

I am of the opinion that every L^AT_EX geek, at least once during his life, feels the need to create his or her own class: this is what happened to me and here is the result, which, however, should be seen as a work still in progress. Actually, this class is not completely original, but it is a blend of all the best ideas that I have found in a number of guides, tutorials, blogs and tex.stackexchange.com posts. In particular, the main ideas come from two sources:

- ▶ [Ken Arroyo Ohori's Doctoral Thesis](#), which served, with the author's permission, as a backbone for the implementation of this class;
- ▶ The [Tufte-Latex Class](#), which was a model for the style.

I started writing this class as an experiment, and as such it should be regarded. Since it has always been intended for my personal use, it may not be perfect but I find it quite satisfactory for the use I want to make of it. I share this work in the hope that someone might find here the inspiration for writing his or her own class.

Federico Marotta

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1.1 The main ideas

Many modern printed textbooks have adopted a layout with prominent margins where small figures, tables, remarks and just about everything else can be displayed. Arguably, this layout helps to organise the discussion by separating the main text from the ancillary material, which at the same time is very close to the point in the text where it is referenced.

This text does not aim to be an apology of wide margins, for there are many better suited authors for this task; the purpose of all these words is just to fill the space so that the reader can see how a book written with the kaobook class looks like. Meanwhile, I shall also try to illustrate the features of the class.

The main ideas behind kaobook come from this [blog post](#), and actually the name of the class is dedicated to the author of the post, Ken Arroyo Ohori, which has kindly allowed me to create a class based on his thesis. Therefore, if you want to know more reasons to prefer a 1.5-column layout for your books, be sure to read his blog post.

Another source of inspiration, as you may have noticed, is the [Tufte-Latex Class](#). The fact that the design is similar is due to the fact that it is very difficult to improve something which is already so good. However, I like to think that this class is more flexible than Tufte-Latex. For instance, I have tried to use only standard packages and to implement as little as possible from scratch;¹ therefore, it should be pretty easy to customise anything, provided that you read the documentation of the package that provides that feature.

In this book I shall illustrate the main features of the class and provide information about how to use and change things. Let us get started.

1.2 What this class does

The kaobook class focuses more about the document structure than about the style. Indeed, it is a well-known \LaTeX principle that structure and style should be separated as much as possible (see also Section 1.3 on the following page). This means that this class will only provide commands, environments and in general, the opportunity to do things, which the user may or may not use. Actually, some stylistic matters are embedded in the class, but the user is able to customise them with ease.

The main features are the following:

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1: This also means that understanding and contributing to the class development is made easier. Indeed, many things still need to be improved, so if you are interested, check out the repository on github!

Page Layout The text width is reduced to improve readability and make space for the margins, where any sort of elements can be displayed.

Chapter Headings As opposed to Tufte-Latex, we provide a variety of chapter headings among which to choose; examples will be seen in later chapters.

Page Headers They span the whole page, margins included, and, in twoside mode, display alternatively the chapter and the section name.²

Matters The commands `\frontmatter`, `\mainmatter` and `\backmatter` have been redefined in order to have automatically wide margins in the main matter, and narrow margins in the front and back matters. However, the page style can be changed at any moment, even in the middle of the document.

Margin text We provide commands `\sidenote` and `\marginnote` to put text in the margins.³

Margin figs/tabs A couple of useful environments is `marginfigure` and `marginable`, which, not surprisingly, allow you to put figures and tables in the margins (*cfr.* Figure 1.1).

Margin toc Finally, since we have wide margins, why don't add a little table of contents in them? See `\marginintoc` for that.

Hyperref `hyperref` is loaded and by default we try to add bookmarks in a sensible way; in particular, the bookmarks levels are automatically reset at `\appendix` and `\backmatter`. Moreover, we also provide a small package to enhance hyperreferences to other parts of the text.

Bibliography We want the reader to be able to know what has been cited without having to go to the end of the document every time, so citations go in the margins as well as at the end, as in Tufte-Latex. Unlike that class, however, you are free to customise the citations as you wish.

In addition, the class is based on KOMA-Script's `scrbook`, therefore it inherits all the goodies of that.

1.3 What this class does not

As anticipated, further customisation of the book is left to the user. Indeed, every book may have sidenotes, margin figures and so on, but each book will have its own fonts, toc style, special environments and so on. For this reason, in addition to the class, we provide only sensible defaults, but if these features are not needed, they can be left out. These special packages are located in the style directory, which is organised as follows:

style.sty This package contains the specifications of page layout, headers and footers, chapter headings, and the fonts used throughout the document.

packages.sty Loads additional packages to decorate the writing with special contents (for instance, the `listing` package is loaded here as it is not required in every book). There are also defined some

2: This is another departure from Tufte's design.

3: Sidenotes (like this!) are numbered while marginnotes are not



Figure 1.1: The Mona Lisa.
https://commons.wikimedia.org/wiki/File:Mona_Lisa,_by_Leonardo_da_Vinci,_from_C2RMF_retouched.jpg

useful commands to print the same words always in the same way, *e.g.* latin words in italics or packages in verbatim.

references.sty Some useful commands to manage labeling and referencing, again to ensure that the same elements are referenced always in a consistent way.

environments.sty Provides special environments, like boxes. Both simple and complex environments are available; by complex we mean that they are endowed with a counter, floating and can be put in a special table of contents.⁴

theorems.sty The style of mathematical environments. Acutally, there are two such packages: one is for plain theorems, *i.e.* the theorems are printed in plain text; the other uses `mdframed` to draw a box around theorems. You can plug the most appropriate style into its document.

In the rest of the book, I shall assume that the reader is not a novice in the use of \LaTeX , and refer to the documentation of the packages used in this class for things that are already explained there. Moreover, I assume that the reader is willing to make minor edits to the provided packages for styles, environments and commands, if he or she does not like the default settings.

4: See Chapter 7 on page 18 for some examples.

The audacious users might feel tempted to edit some of these packages. I'd be immensely happy if they sent me examples of what they have been able to do!

CLASS OPTIONS, COMMANDS AND ENVIRONMENTS

In this chapter I will describe the most common options used, both the ones inherited from `scrbook` and the `kao`-specific ones. Options passed to the class modifies its default behaviour; beware though that some options may lead to unexpected results...

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2.1 KOMA options

The `kaobook` class is based on `scrbook`, therefore it understands all of the options you would normally pass to that class. If you have a lot of patience, you can read the KOMA-Scriptguide.⁶ Actually, the reading of such guide is suggested as it is very instructive.

6: The guide can be downloaded from <https://ctan.org/pkg/koma-script?lang=en>.

Every KOMA-Scriptoption you pass to the class when you load it is automatically activated. In addition, in `kaobook` some options have modified default values. For instance, the font size is 9.5pt and the paragraphs are separated by space⁷, not marked by indentation.

7: To be precise, they are separated by half a line worth of space: the `parskip` value is 'half'.

2.2 kao options

In the future I plan to add more options to set the paragraph formatting (justified or ragged) and the position of the margins (inner or outer in twoside mode, left or right in oneside mode)⁸.

I take this opportunity to renew the call for help: everyone is encouraged to add features or reimplement existing ones, and to send me the results. You can find the github repository at <https://github.com/fmarotta/kaobook>.

8: As of now, paragraphs are justified, formatted with `\singlespacing` (from the `setspace` package) and `\frenchspacing`.

To Do

Implement the `justified` and `margin` options. To be consistent with the KOMA-Scriptstyle, they should accept a simple switch as a parameter, where the simple switch should be `true` or `false`, or one of the other standard values for simple switches supported by KOMA-Script. See the KOMA-Scriptdocumentation for further information.

The above box is an example of a `kaobox`, which will be discussed more thoroughly in Chapter 7 (Mathematics and Boxes) on page 18. Throughout the book I shall use these boxes to remarks what still needs to be done.

2.3 Other things worth knowing

A bunch of packages are already loaded in the class because they are needed for the implementation. These include:

- ▶ etoolbox
- ▶ calc
- ▶ xifthen
- ▶ xkeyval
- ▶ xparse
- ▶ xstring

Many more packages are loaded, but they will be discussed in due time. Here, we will mention only one more set of packages, needed to change the paragraph formatting (recall that in the future there will be options to change this). In particular, the packages we load are:

- ▶ ragged2e
- ▶ setspace
- ▶ hyphenat
- ▶ microtype
- ▶ needspace
- ▶ xspace
- ▶ xcolor (with options `usenames`, `dvipsnames`)

Some of the above packages do not concern paragraph formatting, but we nevertheless grouped them with the others. By default, the main text is justified and formatted with `singlespacing` and `frenchspacing`; the margin text is the same, except that the font is a bit smaller.

2.4 Document Structure

We provide optional arguments to the `\title` and `\author` commands so that you can insert short, plain text versions of this fields, which can be used, typically in the half-title or somewhere else in the front matter, through the commands `\@plaintitle` and `\@plainauthor`, respectively. The PDF properties `pdftitle` and `pdfauthor` are automatically set by `hyperref` to the plain values if present, otherwise to the normal values.⁹

There are defined two page layouts, `margin` and `wide`, and two page styles, `plain` and `fancy`. The layout basically concern the width of the margins, while the style refers to headers and footer.¹⁰

The commands `\frontmatter`, `\mainmatter`, and `\backmatter` have been redefined in order to automatically change page layout and style for these sections of the book. The front matter uses the `margin` layout and the `plain` page style. In the mainmatter the margins are wide and the headings are fancy. In the appendix the style and the layout do not change; however we use `\bookmarksetup{startatroot}` so that the bookmarks of the chapters are on the root level (without this, they would be under the preceding part). In the backmatter the margins shrink again and we also reset the bookmarks root.

9: We think that this is an important point so we remark it here. If you compile the document with `pdflatex`, the PDF metadata will be altered so that they match the plain title and author you have specified; if you did not specify them, the metadata will be set to the normal title and author.

10: Layout and styles will be discussed in Chapter ?? (??) on page ?? . For now, suffice it to say that pages with the `margin` layout have wide margins, while with the `wide` layout the margins are absent. In `plain` pages the headers and footer are suppressed, while in `fancy` pages there is a header.

Sidenotes are a distinctive feature of all 1.5-column-layout books. Indeed, having wide margins means that some material can be displayed there. We use margins for all kind of stuff: sidenotes, marginnotes, small tables of contents, citations, and, why not?, special boxes and environments.

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3.1 Sidenotes

Sidenotes are like footnotes, except that they go in the margin, where they are more readable. To insert a sidenote, just use the command `\sidenote{Text of the note}`. You can specify a mark^O with `\sidenote[mark]{Text}`, but you can also specify an offset, which moves the sidenote upwards or downwards, like so: `\sidenote[offset][mark]{Text}`. You always have to add the brackets for the mark, but they can be empty.¹² The format of the actual sidenote can be changed with the command `\setsidenotes`, which allows you to modify, for instance, the format of the markers and the separator between the marker and the text of the sidenote.

O: This sidenote has a special mark, a big O!

12: If you want to know more about the usage of the `\sidenote` command, read the documentation of the `snotez` package.

There was an alternative package, `sidenotes`, which we could have used. In the end we went for `snotez` because it was the one used in Ken Ohori's thesis, which inspired this class. The features are very similar, but one additional thing offered by `snotez` is that the offset can be specified as a multiple of `\baselineskip`. For example, if you want to enter a sidenote with the normal mark and move it upwards one line, type:

```
\sidenote[*-1][]{Text of the sidenote.}
```

Sidenotes are handled through the `snotez` package, which in turn relies on the `marginnote` package.

3.2 Marginnotes

This command is very similar to the previous one. You can create a marginnote with `\marginnote[offset]{Text}`, where the offset argument can be left out, or it can be a multiple of `\baselineskip`, e.g.

```
\marginnote[-12pt]{Text} or \marginnote[*-3]{Text}.
```

To Do

A small thing that needs to be done is to renew the `\sidenote` command so that it takes only one optional argument, the offset. The special mark argument can go somewhere else. In other words, we want the syntax of `\sidenote` to resemble that of `\marginnote`.

While the command for margin notes comes from the `marginnote` package, it has been redefined in order to change the position of the optional offset argument, which now precedes the text of the note, whereas in the original version it was at the end. We have also added the possibility to use a multiple of `\baselineskip` as offset. These things were made only to make everything more consistent, so that you have to remember less things!

We load the packages `marginnote`, `marginfix` and `placeins`. Since `snotes` uses `marginnote`, what we said for `marginnotes` is also valid for `sidenotes`. Side- and margin- notes are shifted slightly upwards (`\renewcommand{\marginnotevadjust}{3pt}`) in order to allineate them to the bottom of the line of text where the note is issued.

3.3 Footnotes

Even though they are not displayed in the margin, we will discuss about footnotes here, since `sidenotes` are mainly intended to be a replacement of them. Footnotes force the reader to constantly move from one area of the page to the other. Arguably, `marginnotes` solve this issue, so you should not use footnotes. Nevertheless, for completeness, we have left the standard command `\footnote`, just in case you want to put a footnote once in a while.*

3.4 Margintoc

Since we are talking about margins, we introduce here the `\margintoc` command, which allows one to put small table of contents in the margin. Like other commands we have discussed, `\margintoc` accepts a parameter for the vertical offset, like so: `\margintoc[offset]`.

The command can be used in any point of the document, but we think it makes sense to use it just at the beginning of chapters or parts. In this document I make use of a KOMA-Script feature and put it in the chapter preamble, with the following code:

```
\setchapterpreamble[u]{\margintoc}
\chapter{Chapter title}
```

Not only textual stuff can be displayed in the margin, but also figures. Those will be the focus of the next chapter.

The font used in the `margintoc` is the same as the one for the chapter entries in the main table of contents at the beginning of the document.

* And this is how they look like. Notice that in the PDF file there is a back reference to the text; pretty cool, uh?

4 Figures and Tables

4.1 Normal figures and tables

Figures and tables can be inserted just like in any standard \LaTeX document. The `graphicx` package is already loaded and configured in such a way that the figure width is equal to the `textwidth` and the height is adjusted in order to maintain the original aspect ratio. As you may have imagined, the captions will be positioned... well, in the margins. This is achieved with the help of the `floatrow` package.

Here is a picture of Mona Lisa (Figure 4.1), as an example. The captions are formatted as the margin- and the side-notes; If you want to change something about captions you can use the command `\captsetup` from the `caption` package. Remember that if you want to reference a figure, the label must come *after* the caption!



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Figure 4.1: It's Mona Lisa again. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

While the format of the caption is managed by `caption`, its position is handled by the `floatrow` package. Achieving this result has been quite hard, but now I am pretty satisfied.

To Do

The only problem is that if you want to use `oneside` mode, as in this document, you have to manually setup `floatrow` so that it prints the captions in the right margin instead of alternatively in the right and left margins, *i.e.* you have to change ‘hangoutside’ to ‘hangright’. This can be automatically done by recognising the two- or one-side options, but there must be a way to fix this strange behaviour using only `floatrow`. If you know something about it, please let me know.

Tables can be inserted just as easily as figures, as exemplified by the following code:

```
1 \begin{table}
2 \begin{tabular}{c c c c }
3   \toprule
4   col1 & col2 & col3 & col 4 \\\
5   \midrule
6   \multirow{3}{4em}{Multiple row} & cell2 & cell3 & cell4
7   \\\ & cell5 & cell6 & cell7 \\\ & cell8 & cell9 & cell10 \\\
9   \multirow{3}{4em}{Multiple row} & cell2 & cell3 & cell4
10  \\\ & cell5 & cell6 & cell7 \\\ & cell8 & cell9 & cell10 \\\
12  \bottomrule
13 \end{tabular}
14 \end{table}
```

which results in the useless Table 4.1.

I don’t have much else to say, so I will just insert some blind text. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written

col1	col2	col3	col 4
Multiple row	cell2	cell3	cell4
	cell5	cell6	cell7
	cell8	cell9	cell10
Multiple row	cell2	cell3	cell4
	cell5	cell6	cell7
	cell8	cell9	cell10

Table 4.1: A useless table.

in of the original language. There is no need for special content, but the length of words should match the language.

4.2 Margin figures and tables

Marginfigures can be inserted with the environment `marginfigure`. In this case, the whole picture is confined to the margin and the caption is below it. Figure 1.1 is obtained with something like this:

```
1 \begin{marginfigure}
2   \includegraphics{monalisa}
3   \caption[The Mona Lisa]{The Mona Lisa.}
4   \labfig{marginmonalisa}
5 \end{marginfigure}
```

There is also the `margintable` environment, of which Table 4.2 is an example. Notice how you can place the caption above the table by just issuing the `\caption` command before beginning the tabular environment. Usually, figure captions are below, while table captions are above.

Marginfigures and tables can be positioned with an optional offset command, like so:

```
1 \begin{marginfigure}[offset]
2   \includegraphics{images/seaside}
3 \end{marginfigure}
```

Offset can be either a measure or a multiple of `\baselineskip`, much like with `\sidenote`, `\marginnote` and `\margintoc`. If you are wondering how I inserted this orange bubble, have a look at the `todo` package.

Table 4.2: Another useless table.

col1	col2	col3
Multiple	cell2	cell3
row	cell5	cell6
	cell8	cell9

Improve this part.

4.3 Wide figures and tables



Figure 4.2: A wide seaside, and a wide caption. Credits: By Bushra Feroz — Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=68724647>

With the environments `figure*` and `table*` you can insert figures which span the whole page width. The caption will be positioned below.

You may have noticed the full width image at the very beginning of this chapter: that, however, is set up in an entirely different way, which you'll read about in Chapter ?? on page ??.

5.1 Citations

To cite someone [1, 2] is very simple: just use the `\sidecite` command. It does not have an offset argument yet, but it probably will in the future. This command supports multiple entries, as you can see, and by default it prints the reference on the margin as well as adding it to the bibliography at the end of the document. For this setup I used `biblatex` but I think that workarounds are possible.[2] Note that the citations have nothing to do with the text, they are completely random as they only serve the purpose to illustrate the feature.

[1]: Visscher et al. (2008), ‘Heritability in the genomics era—concepts and misconceptions.’

[2]: James et al. (2013), *An Introduction to Statistical Learning*

[2]: James et al. (2013), *An Introduction to Statistical Learning*

5.2 Glossaries and Indices

The `kaobook` class loads the packages `glossaries` and `imakeidx`, with which you can add glossaries and indices to your book. For instance, I previously defined some glossary entries and now I am going to use them, like this: `computer`. `glossaries` also allows you to use acronyms, like the following: this is the full version, `Frame per Second (FPS)`, and this is the short one `FPS`. These entries will appear in the glossary in the backmatter.

Unless you use `Overleaf` or some other fancy IDE for \LaTeX , you need to run an external command from your terminal in order to compile a document with a glossary. In particular, the commands required are:¹⁵

```
$ pdflatex main.tex
$ makeglossaries main
$ pdflatex main.tex
```

Note that you need not run `makeglossaries` every time you compile your document, but only when you change the glossary entries.

To create an index, you need to insert the command `\index{subject}` whenever you are talking about ‘subject’ in the text. For instance, at the start of this paragraph I would write `index{index}`, and an entry would be added to the Index in the backmatter. Check it out!

A nomenclature is just a special kind of index; you can find one at the end of this book. To insert a nomenclature, we use the package `nomencl` and add the terms with the command `\nomenclature`. We put then a `\printnomenclature` where we want it to appear.

Also with this package we need to run an external command to compile the document, otherwise the nomenclature will not appear:

```
$ pdflatex main.tex
$ makeindex main.nlo -s nomencl.list -o main.nls
$ pdflatex main.tex
```

¹⁵: These are the commands you would run on a UNIX system; for Windows, have a look at the documentation.

In theory, you would need to run an external command for the index as well, but luckily the package we suggested, `imakeidx`, can compile the index automatically.

These packages are all loaded in `packages.sty`, one of the files that come with this class. However, the configuration of the elements is best done in the `main.tex` file, since each book will have different entries and styles.

This brief section was by no means a complete reference on the subject, therefore you should consult the documentation of the above package to gain a full understanding of how they work.

5.3 Hyperreferences

In this class we provide a handy sub-package to help you referencing the same elements always in the same way, for consistency across the book. First, you can label each element with a specific command. For instance, should you want to label a chapter, you would put `\labch{chapter-title}` right after the `\chapter` directive. This is just a convenience, because `\labch` is actually just an alias to `\label{ch:chapter-title}`, so it spares you the writing of ‘ch’. We defined similar commands for many typically labeled elements, including:

- ▶ Page: `\labpage`
- ▶ Part: `\labpart`
- ▶ Chapter: `\labch`
- ▶ Section: `\labsec`
- ▶ Figure: `\labfig`
- ▶ Table: `\labtab`
- ▶ Definition: `\labdef`
- ▶ Theorem: `\labthm`
- ▶ Proposition: `\labprop`
- ▶ Lemma: `\lablemma`
- ▶ Remark: `\labremark`
- ▶ Example: `\labexample`
- ▶ Exercise: `\labexercise`

Of course, we have similar commands for referencing those elements. However, since the style of the reference should depend on the context, we provide different commands to reference the same thing. For instance, in some occasions you may want to reference the chapter by name, but other times you want to reference it only by number. In general, there are four reference style, which we call plain, vario, name, and full.

The plain style references only by number. It is accessed, for chapters, with `\refch{chapter-title}` (for other elements, the syntax is analogous). Such a reference results in: Chapter 5.

The vario and name styles rest upon the `varioref` package. Their syntax is `\vrefch{chapter-title}` and `\nrefch{chapter-title}`, and they result in: Chapter 5 on the preceding page, for the vario style, and: Chapter 5 (References), for the name style. As you can see, the page is referenced in `varioref` style.

The full style references everything. You can use it with `\frefch{chapter-title}` and it looks like this: Chapter 5 (References) on the previous page.

Of course, all the other elements have similar commands (*e.g.* for parts you would use `\vrefpart{part-title}` or something like that). However, not all elements implement all the four styles. The provided commands should be enough, but if you want to see what is available or to add the missing ones, have a look at the [provided package](#).

DESIGN AND ADDITIONAL FEATURES



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6.1 Headings

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gef-burn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

6.2 Headers & Footers

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gef-burn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

6.3 Table of Contents

Another option that is activated by default changes the style of the table of contents. By default, there is an entry for everything: list of figures, list of tables, indices, glossaries and bibliographies. There are also entries for the table of contents itself (thanks to the `\setuptoc{toc}{totoc}`)

command). If you want entries for the glossaries as well, you can set the `toc` option of the package `glossaries`.¹⁷

By default, dispositions are numbered up to the section thanks to the command `\setcounter{secnumdepth}{1}`. The table of contents can be modified through the package `etoc`, which is loaded because it is needed for the `margintocs`, or the more traditional `tocbase`. The sidenotes are numbered on a per-chapter basis, with the `chngcnt` package; if you want to have only one counter for the whole document, check the provided `style.sty` file.

The sidenote counter is reset at every chapter, but you can change that with the `\counterwithout` command.

The space between the figure and the text can be specified with the following commands:

```
\renewcommand\FBskip{4pt}
\renewcommand\FBbskip{4pt}
```

17: If you don't want all these things in the table of contents, pass the appropriate KOMA options to the class.

We also load `xcolor`.

Mathematics and Boxes

7.1 Theorems

Despite most people complain at the sight of a book full of equations, mathematics is an important part of many books. Here, we shall illustrate some of the possibilities. We believe that theorems, definitions, remarks and examples should be emphasised with a shaded background; however, the colour should not be too heavy on the eyes, so we have chosen light yellow.¹⁹

Definition 7.1.1 *Let (X, d) be a metric space. A subset $U \subset X$ is an open set if, for any $x \in U$ there exists $r > 0$ such that $B(x, r) \subset U$. We call the topology associated to d the set τ_d of all the open subsets of (X, d) .*

Definition 7.1.1 is very important. I am not joking, but I have inserted this phrase only to show how to reference definitions. The following statement is repeated over and over in different environments.

Theorem 7.1.1 *A finite intersection of open sets of (X, d) is an open set of (X, d) , i.e τ_d is closed under finite intersections. Any union of open sets of (X, d) is an open set of (X, d) .*

Proposition 7.1.2 *A finite intersection of open sets of (X, d) is an open set of (X, d) , i.e τ_d is closed under finite intersections. Any union of open sets of (X, d) is an open set of (X, d) .*

Lemma 7.1.3 *A finite intersection^a of open sets of (X, d) is an open set of (X, d) , i.e τ_d is closed under finite intersections. Any union of open sets of (X, d) is an open set of (X, d) .*

^a I'm a footnote

19: The boxes are all of the same colour here, because we did not want our document to look like [Harlequin](#).

You can even insert footnotes inside the theorem environments; they will be displayed at the bottom of the box.

You can safely ignore the content of the theorems...

Corollary 7.1.4 (Finite Intersection, Countable Union) *A finite intersection of open sets of (X, d) is an open set of (X, d) , i.e τ_d is closed under finite intersections. Any union of open sets of (X, d) is an open set of (X, d) .*

Proof. The proof is left to the reader as a trivial exercise. Hint: Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get

no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language. \square

Definition 7.1.2 Let (X, d) be a metric space. A subset $U \subset X$ is an open set if, for any $x \in U$ there exists $r > 0$ such that $B(x, r) \subset U$. We call the topology associated to d the set τ_d of all the open subsets of (X, d) .

Example 7.1.1 Let (X, d) be a metric space. A subset $U \subset X$ is an open set if, for any $x \in U$ there exists $r > 0$ such that $B(x, r) \subset U$. We call the topology associated to d the set τ_d of all the open subsets of (X, d) .

Remark 7.1.1 Let (X, d) be a metric space. A subset $U \subset X$ is an open set if, for any $x \in U$ there exists $r > 0$ such that $B(x, r) \subset U$. We call the topology associated to d the set τ_d of all the open subsets of (X, d) .

As you may have noticed, definitions, example and remarks have independent counters; theorems, propositions, lemmas and corollaries share the same counter.

Remark 7.1.2 Here is how an integral looks like inline: $\int_a^b x^2 dx$, and here is the same integral displayed in its own paragraph:

$$\int_a^b x^2 dx$$

We provide two files for the theorem styles: `plaintheorems.sty`, which you should include if you do not want coloured boxes around theorems; and `mdftheorems.sty`, which is the one used for this document. Of course, you will have to edit these files according to your taste and the general style of the book.

7.2 Boxes & Custom Environments ²⁰

Say you want to insert a special section, an optional content or just something you want to emphasise. We think that nothing works better than a box in these cases. We used `mdframed` to construct the ones shown below. You can create and modify such environments by editing the provided file `environments.sty` (check the github repository).

Title of the box

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information?

Here is a random equation, just because we can:

$$x = a_0 + \frac{1}{a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \frac{1}{a_4}}}}$$

²⁰: Notice that in the table of contents and in the header, the name of this section is ‘Boxes & Environments’; we achieved this with the optional argument of the section command.

Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

If you set up a counter, you can even create your own numbered environment.

Comment 7.2.1

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

7.3 Experiments

It is possible to wrap marginnotes inside boxes, too. Audacious readers are encouraged to try their own experiments and let me know the outcomes.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

title of margin note

Margin note inside a kaobox.
(Actually, kaobox inside a margin-note!)

APPENDIX



Heading on Level 0 (chapter)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gef-burn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

A.1 Heading on Level 1 (section)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gef-burn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Heading on Level 2 (subsection)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gef-burn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Heading on Level 3 (subsubsection)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text,

you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Heading on Level 4 (paragraph) Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

A.2 Lists

Example for list (itemize)

- ▶ First item in a list
- ▶ Second item in a list
- ▶ Third item in a list
- ▶ Fourth item in a list
- ▶ Fifth item in a list

Example for list (4*itemize)

- ▶ First item in a list
 - First item in a list
 - * First item in a list
 - First item in a list
 - Second item in a list
 - * Second item in a list
 - Second item in a list
- ▶ Second item in a list

Example for list (enumerate)

1. First item in a list
2. Second item in a list
3. Third item in a list
4. Fourth item in a list
5. Fifth item in a list

Example for list (4*enumerate)

1. First item in a list
 - a) First item in a list
 - i. First item in a list
 - A. First item in a list
 - B. Second item in a list
 - ii. Second item in a list
 - b) Second item in a list
2. Second item in a list

Example for list (description)

First item in a list
Second item in a list
Third item in a list
Fourth item in a list
Fifth item in a list

Example for list (4*description)

First item in a list
 First item in a list
 First item in a list
 First item in a list
 Second item in a list
 Second item in a list
 Second item in a list
Second item in a list

Bibliography

- [1] Peter M Visscher, William G Hill, and Naomi R Wray. 'Heritability in the genomics era—concepts and misconceptions.' In: *Nat. Rev. Genet.* 9.4 (2008), pp. 255–266. DOI: [10.1038/nrg2322](https://doi.org/10.1038/nrg2322) (cited on page 13).
- [2] Gareth James et al. *An Introduction to Statistical Learning*. 2013 (cited on page 13).

Notation

The next list describes several symbols that will be later used within the body of the document.

c Speed of light in a vacuum inertial frame

h Planck constant

Greek letters with pronunciation

Character	Name	Character	Name
α	alpha <i>AL-fuh</i>	ν	nu <i>NEW</i>
β	beta <i>BAY-tuh</i>	ξ, Ξ	xi <i>KSIGH</i>
γ, Γ	gamma <i>GAM-muh</i>	\omicron	omicron <i>OM-uh-CRON</i>
δ, Δ	delta <i>DEL-tuh</i>	π, Π	pi <i>PIE</i>
ϵ	epsilon <i>EP-suh-lon</i>	ρ	rho <i>ROW</i>
ζ	zeta <i>ZAY-tuh</i>	σ, Σ	sigma <i>SIG-muh</i>
η	eta <i>AY-tuh</i>	τ	tau <i>TOW (as in cow)</i>
θ, Θ	theta <i>THAY-tuh</i>	υ, Υ	upsilon <i>OOP-suh-LON</i>
ι	iota <i>eye-OH-tuh</i>	ϕ, Φ	phi <i>FEE, or FI (as in hi)</i>
κ	kappa <i>KAP-uh</i>	χ	chi <i>KI (as in hi)</i>
λ, Λ	lambda <i>LAM-duh</i>	ψ, Ψ	psi <i>SIGH, or PSIGH</i>
μ	mu <i>MEW</i>	ω, Ω	omega <i>oh-MAY-guh</i>

Capitals shown are the ones that differ from Roman capitals.

Special Terms

C

computer is a programmable machine that receives input, stores and manipulates data, and provides output in a useful format. 13

F

FPS Frame per Second. 13

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