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Graduate Seminar on Names & Origins

What's in a name?

An exciting study of names

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Contents

1 Introduction

This is a simple template for a brief report in a seminar. If you have used LaTeX before, you should have no trouble accustoming yourself to it. You may use UTF-8 characters in the document, provided your font supports them:

> Allein der Vortrag macht des Redners Glück

The default font in this document supports (at least) German, French, and English characters. You should hence have no problem typesetting complicated names such as *Henri Poincaré* or *Cédric Villani*. In the following, this document discusses how to typeset certain things.

1.1 Typesetting tables

Tables should be wrapped in a `table` environment and have a proper caption and label for references. Moreover, typographically correct lines (also known as *rules*) should be used. The following example demonstrates this:

```
\begin{table}
  \centering
  \begin{tabular}{lSS}
    \toprule
    [...]
    \midrule
    Mount Everest & 8848 & 8848\\
    [...]
    \bottomrule
  \end{tabular}
\end{table}
\caption{%
  [...]
}
\label{tab:Mountains}
```

Table 1 on page 4 shows how this looks in practice. Notice that the `S` column requires additional curly brackets in order to detect a column heading correctly. If these brackets are omitted, the heading may not be parsed correctly.

Mountain	**Height in** m	**Prominence in** m
Mount Everest	8848	8848
K2	8611	4020
Kangchenjunga	8586	3922
Lhotse	8516	610

Table 1: The highest mountains along with their prominence values. This example also demonstrates the use of the `s` column, which permits automatically aligning numbers, as well as the `siunitx` package for typesetting units correctly.

1.2 Typesetting figures

Use the standard `\includegraphics` syntax to include figures. By default, figures may be specified with their full (relative) path. You may also omit a leading `Figures/` folder because LaTeX is going to automatically look for files in this directory. Notice that specifying the file extension should be unnecessary.

```
\begin{figure}[b]
  \centering
  \includegraphics[width=\textwidth]{Koenigsberg}
  \caption{%
    A map of Königsberg from about 1813. Modified from an engraving by
    Joachim Bering from 1613. For annotations, you could use
    \texttt{TikZ} or the \texttt{overpic} package.
  }
  \label{fig:Koenigsberg}
\end{figure}
```

Figure Figure 1 on 5 depicts an example. Please ensure that figures are referenced properly and give credit to the original author if you use a figure from a publication. You should also check that the resolution of the figure is sufficient. If in doubt, recreate the figure yourself, using `TikZ`[1], `pgfplots`[2], or any vector graphics application such as `Inkscape`[3].

If you want to add multiple subordinate figures under a larger figure, use the `subcaption` package that is included by default. It is good practice to use the `\subcaptionbox` command for wrapping figures. The first parameter to this command is the caption of the figure. It may remain empty or contain only a `\label` command for subsequent references.

[1] http://www.texample.net/tikz
[2] http://pgfplots.sourceforge.net
[3] https://inkscape.org/en

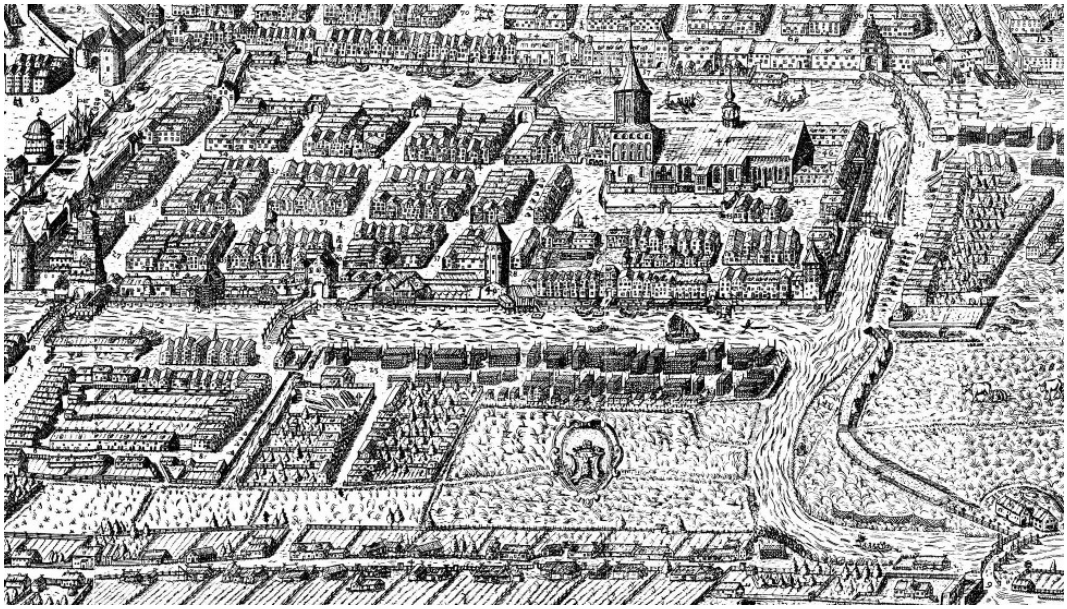

Figure 1: A map of Königsberg from about 1813. Modified from an engraving by Joachim Bering from 1613. For annotations, you could use `TikZ` or the `overpic` package.

It is possible to refer to the complete sub-figure using the usual reference commands. If you want to refer to an individual sub-figure only, use the `\subref` command.

```
\begin{figure}
  \centering
  \subcaptionbox{Label\label{sfig:Label}}{%
    \begin{tikzpicture}
      ...
    \end{tikzpicture}
  }
\end{figure}
```

Figure 2 depicts numerous sub-figures in order to show all members of Anscombe's quartet. Figure 2a is the first one of these. This figure is also denoted by (a), although you should use such a reference only within a caption because it may be confusing to readers—and by extension, it may also confuse the people who grade your report.

Please refer to the source code for more information. It also demonstrates the use of the `pgfplots` package for high-quality typesetting of statistical graphics. An introduction would go beyond the scope of this document, though, but this package is highly recommend if you want your graphics to have a consistent look-and-feel.

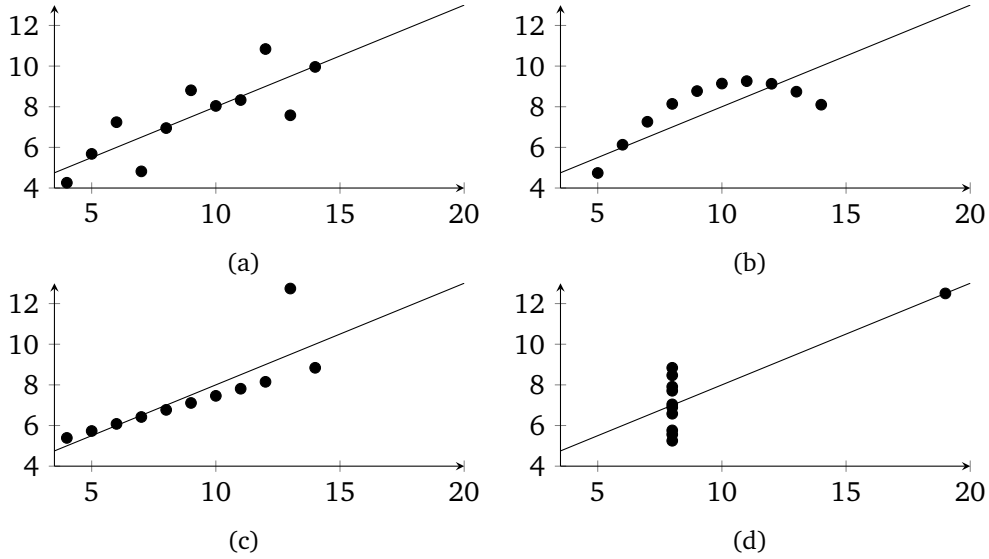

Figure 2: Multiple figures are best shown using the `subcaption` package. Individual figures may be referenced using the `\subref` command. (a) depicts the first member of Anscombe's quartet, a classical data set in statistics.

1.3 Typesetting mathematics

This template uses `amsmath` and `amssymb`, which are the de-facto standard for typesetting mathematics. Use numbered equations using the `equation` environment. If you want to show multiple equations and align them, use the `align` environment:

$$V := \{1, 2, \ldots\} \tag{1}$$

$$E := \big\{(u, v) \mid \operatorname{dist}(p_u, p_v) \leq \epsilon\big\} \tag{2}$$

Define new mathematical operators using `\DeclareMathOperator`. See the template for some examples. Else, your operator will be typeset incorrectly. Observe the difference between the incorrect (left) and correct (right) usage:

$$cosx \neq \cos x \tag{3}$$

Moreover, this template contains a correct differential operator. Use `\d` to typeset the differential of integrals:

$$f(u) := \int_{v \in \mathbb{D}} \operatorname{dist}(u, v)\,\mathrm{d}v \tag{4}$$

Take a look at the source for more examples. If in doubt, ask the organizers for help.

Algorithm 1: 0-dimensional persistent homology calculation

Require: A weighted graph $\mathcal{G}$
$\texttt{UF} \leftarrow \emptyset$ ▷ Initialize an empty Union–Find structure
$\mathcal{D} \leftarrow \emptyset$ ▷ Initialize an empty persistence diagram
for every edge $(u, v) \in \mathcal{G}$ in ascending order of its weight **do**
  $c \leftarrow \texttt{UF.Find}(u)$
  $c' \leftarrow \texttt{UF.Find}(v)$
  if $\mathrm{w}(c) < \mathrm{w}(c')$ **then** ▷ c is the older component; merge c' into it
    $\texttt{UF.Union}(c', c)$
    $\mathcal{D} \leftarrow \mathcal{D} \cup \big(\mathrm{w}(c'), \mathrm{w}(u, v)\big)$
  else ▷ c' is the older component; merge c into it
    $\texttt{UF.Union}(c, c')$
    $\mathcal{D} \leftarrow \mathcal{D} \cup \big(\mathrm{w}(c), \mathrm{w}(u, v)\big)$
  end if
end for
return $\mathcal{D}$

The documentation of the `amsmath` package[4] is also extremely useful. Likewise, the guide by Mark Tomforde[5] contains a variety of useful tips and tricks. Remember that typesetting complicated things takes some time, but is usually worth the effort because *you* understand it better, and so the reader might understand it better as well.

1.4 Typesetting algorithms

This template suggests using the `algorithmi` package for typesetting an algorithm. It is customizable and offers sufficient flexibility to cover most usage scenarios. Feel free to use another package, though, or refer to the extensive documentation[6]. There's no standard for pseudo-code, so feel free to use any format that seems acceptable to you. Always use a caption and a label for your algorithm, so that you may refer to it correctly, e.g. Algorithm 1.

Notice that for most reports, adding specific algorithms should not be necessary. However, you are free to go the extra mile if you consider this to improve the report, in particular if you reference the algorithm numerous times or if the implementation is a large part of the contribution.

[4] http://mirrors.ctan.org/macros/latex/required/amsmath/amsmath.pdf
[5] https://www.math.uh.edu/~tomforde/MathWriting.pdf
[6] http://mirror.unl.edu/ctan/macros/latex/contrib/algorithmicx/algorithmicx.pdf

2 Adding content

This source is in a separate file to demonstrate how to `include` things. It is good style to let a new section begin on a new page. But you do not have to do this, of course. If you write longer text, make judicious use of paragraph breaks by adding newlines. For example, this is the last line of the paragraph.

And now a new paragraph begins. The short indent of the new paragraph makes it easier for a reader to perceive breaks in the text, but it is not as harsh to the eye as a completely blank line. Do *not* fiddle with the indent or with the spacing between paragraphs!

Along with the standard environments, this template offers `paralist` for lists within paragraphs. Here's a quick example: The American constitution speaks, among others, of (i) life (ii) liberty (iii) the pursuit of happiness. When writing a report, you hopefully have all of these.

2.1 Citations & bibliography

Use the `\autocite` command to cite literature. Do *not* use citations in lieu of nouns. Hence, the following is generally frowned upon:

> As [1] shows, ...

Instead, use this:

> As previously shown [1], ...

Or better:

> As Edelsbrunner and Harer [1] showed, ...

You may also use special citation commands for the author names, e.g. `\citet` or `\citep`, but this guide prefers typing the author names yourself. It is also possible to use `\autocites` to cite multiple authors. So we could also talk about previous work by Edelsbrunner et al. [1, 2]. Citations will be sorted automatically.

Particular care should be take in order to properly format citations that you download from somewhere. Even Google Scholar is known to produce incorrect references. When in doubt, consult the documentation[7]. The bibliography of this template also contains some examples of proper bibliography usage.

[7] https://en.wikibooks.org/wiki/LaTeX/Bibliography_Management

2.2 Text in other languages

Since this template uses `babel` to support different languages, you can easily add "foreign" text by wrapping it in `otherlanguage`:

> Uns ist in alten Geschichten viel Herrliches erzählt worden: von ruhmvollen Helden und ihren schweren Kämpfen, von höchstem Glück, von tiefstem Schmerz und von dem Heldenkampf der tapferen Burgunden könnt Ihr jetzt eine herrliche Geschichte vernehmen.

This works for all languages that have been used as optional arguments in the inclusion of the `babel` package. At present, this only includes English (the default language) and French:

> Le roi Charles, notre empereur, le Grand, sept ans tous pleins est resté dans l'Espagne : jusqu'à la mer il a conquis la terre hautaine. Plus un château qui devant lui résiste, plus une muraille à forcer, plus une cité, hormis Saragosse, qui est sur une montagne. Le roi Marsile la tient, qui n'aime pas Dieu. C'est Mahomet qu'il sert, Apollin qu'il prie. Il ne peut pas s'en garder : le malheur l'atteindra.

You may add other languages as well but should make sure that the main language of the document is the *last* one that is specified, as it controls how things like the table of contents are named.

2.3 Other resources

Other resources comprise an excellent guide on how to write a seminar report[8], as well as Donald Knuth's lectures on mathematical writing[9], although this last guide is more relevant for writing about, well, mathematics. There are also some good starting points about *writing* papers and *reading* them by Bob Laramee [3, 4].

[8] http://gvv.mpi-inf.mpg.de/teaching/how_to_thesis/how_to_write_a_report_slussalek.pdf
[9] http://jmlr.csail.mit.edu/reviewing-papers/knuth_mathematical_writing.pdf

References

1. H. Edelsbrunner and J. Harer. *Computational topology: An introduction*. American Mathematical Society, Providence, RI, USA, 2010.
2. H. Edelsbrunner, D. Letscher, and A. J. Zomorodian. "Topological persistence and simplification". *Discrete & Computational Geometry* 28:4, 2002, pp. 511–533. DOI: 10.1007/s00454-002-2885-2.
3. R. S. Laramee. "How to read a visualization research paper: Extracting the essentials". *IEEE Computer Graphics and Applications* 31:3, 2011, pp. 78–82. DOI: 10.1109/MCG.2011.44.
4. R. S. Laramee. "How to write a visualization research paper: A starting point". *Computer Graphics Forum* 29:8, 2010, pp. 2363–2371. DOI: 10.1111/j.1467-8659.2010.01748.x.