

Prime Numbers and Prime Factorization

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Basics

Statistics is understanding data by modelling it.

Data $Y^{(n)} = (Y_1, \dots, Y_n)$ usually *random*.

$\mathbb{P} = \mathcal{L}(Y^{(n)})$, the *unknown* joint distribution.

Statistical problem: to infer on \mathbb{P} from the data $Y^{(n)}$.

Parametric modelling:

$$\mathbb{P} = \mathbb{P}_{\boldsymbol{\theta}} \in \{\mathbb{P}_{\boldsymbol{\theta}}, \boldsymbol{\theta} \in \Theta \subset \mathbb{R}^p\}.$$

Nonparametric modelling: the parametric assumption is not fulfilled, or, equivalently, $p = \infty$.



Outline

1. Attract the audience ✓
2. The scientific message
3. Explain the method
4. Simulations & discussion of your results
5. Applications and examples
6. Almost EOT = end of talk
7. Provoke few questions
8. Audience: enjoy what you have learnt

Short Title - please modify the figure in the lower right corner: —



The Beamer-Package

- Beamer is the latest package to create slides with \LaTeX
- Slides need to be compiled to PDF, not DVI/Postscript
- Remember: PDFLaTeX accepts PNG, JPEG and PDF not EPS/PS
- If you *need* Postscript, RTFM



The LvB Beamer Style

- The LvB Beamer Style is defined via *beamerdefs.sty*, *colordef.sty* and *lvblisting.sty*, which must always be provided in the source folder.
- All operators are to be defined by `\operatorname{}`. Note the difference:

Var defined by `\operatorname{}`

Var not defined by `\operatorname{}`

- Remember to start and end the `displaymath` environment by `\[` and `\]` and not `$$`.



Predefined comands

- For your convenience you may set up new commands via `\newcommand{}{}`.


- This has been done in the two following cases:

- ▶ Use `\quantnet` to include the quantnet icon (right-aligned):



The name of the quantnet is to be written in black.

- ▶ Use `\BBI{}` to link to the BBI:

Carl Friedrich Gauss on BBI: 

- Some commands are already defined, e.g. `\ln` and `\log`



Equations

- Equations covering several lines may be written in the *align* environment instead of the older *eqnarray* environment. Only this way it can be ensured, that the colour of the equation and of the according equation numbering match.
- `align*` omits the equation numbering, as does `\notag`.

```
1 \begin{align}  
2 4x + 8 &= (3-2)^2\\  
3 4x &= -7 \notag \\  
4 x &= -\frac{7}{4}  
5 \end{align}
```

$$4x + 8 = (3 - 2)^2 \quad (1)$$

$$4x = -7$$
$$x = -\frac{7}{4} \quad (2)$$



Tables

Title	Title
2.13	1.45
3.14	6.85

Table 1: Include a short, but meaningful caption.

- Follow the Cambridge University Press Style.
- Not more than 2 decimal digits in a column.
- Tables and their captions are to be written in black.

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Tables

```
1 \begin{table}
2 \begin{center}
3 \begin{tabular}{cc}
4 \hline\hline
5 Title & Title\\
6 \hline
7 2.13 & 1.45 \\
8 3.14 & 6.85 \\
9 \hline\hline
10 \end{tabular}
11 \caption{Include a short, but meaningful caption.}
12 \end{center}
13 \end{table}
```

Short Title - please modify the figure in the lower right corner: —



Figures

```
1 \begin{figure}[htb]
2   \begin{center}
3     \includegraphics[
4       scale=0.2]{
5         Figures/vola}
6     \caption{Include a
7       short, but
8       meaningful
9       caption.}
10   \end{center}
11 \end{figure}
```

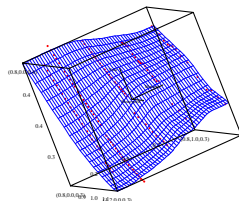


Figure 1: Include a short, but meaningful caption.

The caption is, as in tables, to be written in black and please provide any legend in the caption and not in the graph itself.

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Examples

To create an example, use the color `isegreen` and the following structure:

```
1 \color{isegreen}
2 \textbf{Example:} Example
   title
3
4 \smallskip
5 Here you can state your
   example, which may also
   include calculations.
6 \color{black}
```

Example: Example title

Here you can state your example,
which may also include
calculations.



Subtitles

Subtitles are to be highlighted via bold text and followed by a small skip afterwards (no colon):

```
1 \textbf{Subtitle}  
2  
3 \smallskip  
4 Here you can state the  
   content according to  
   the subtitle.
```

Subtitle

Here you can state the content according to the subtitle.

This may also be applied to state proofs, theorems etc.

Short Title - please modify the figure in the lower right corner:



Brackets

- Use the bracket sequence $\{(a + b = c)\}$
- Conventional bracket rules represent an exemption of this rule.
For example:

$$Y \sim N(\mu(X), \sigma(X))$$

- Let \LaTeX take care about the correct size by preceding the bracket by `\left` and `\right`.



Rules to write nice slides

- Use `\section{}` and `\subsection{}` to structure your presentation. The section will appear in the upper right corner of your slides.
- You can set up hyperlinks via `\label{LINKNAME}` (reference point) and `\ref{LINKNAME}` (reference).
- Use, if necessary, `\displaystyle` to force \LaTeX to display fractions in big font size
- Remember
 - ▶ 6-8 lines per slide
 - ▶ 8 words per line



- The numbering of any enumeration should match the colour of the corresponding text (preset colour: black). Modifications may be made through the *itemize* environment:

`\item[\color{isegreen}1.]`

Itemize items are predefined (blue) and excluded from this rule.

- Use `\top` to write the symbol of transpose, it produces

$$x^{\top}y$$

- Use `\ldots` to write the symbol for three dots, it produces

$$x \in \{1, \dots, n\}$$



- The commands `\widehat{}` and `\widetilde{}` for a hat or a tilde are to be preferred over the the smaller `\hat` respectively `\tilde` commands:

$$\begin{array}{c} \widehat{Y} \text{ vs. } \hat{Y} \\ \widetilde{Y} \text{ vs. } \tilde{Y} \end{array}$$

- The norm is to be written via `\|`. It produces $\|K\|$
- The \mathcal{O} and \mathcal{O} for convergence may be written via `\mathcal{O}` and `\mbox{\scriptsize \mathcal{O}}`.
- The operator for exponential terms with Euler's e as the base is defined by `\exp`:

$$\exp(1) \approx 2.718282$$



- Use `\stackrel{\mathcal{L}}{\rightarrow}` to write the symbol for convergence in distribution and denote the normal distribution by `\operatorname{N}`, this produces

$$X \stackrel{\mathcal{L}}{\rightarrow} N(0, \sigma^2)$$

- Use `\operatorname{P}` to write the symbol for probability, it produces

$$P(X = x) = \frac{\exp(-\lambda)\lambda^x}{x!}$$

- Use `\stackrel{\operatorname{as.}}{\sim}` to write the symbol for asymptotic distribution, it produces

$$X \stackrel{\operatorname{as.}}{\sim} \chi^2$$



- Use command `\stackrel{\operatorname{def}}{=}` to write the symbol for definition, it produces

$$X \stackrel{\text{def}}{=} \frac{a}{b}$$

- Use commands `\Re` or `\Im` to write the symbols for the real or imaginary part, it produces

$$X = \Re\{Y\}, Y = \Im\{Z\}$$

- To write the symbols for the minimizing argument, use `\operatorname{arg}\,` `\underset{x}{\operatorname{min}}`, it produces

$$a = \arg \underset{x}{\min} \{f(x)\}$$



- Use `\operatorname{\mathbf{I}}` for the indicator function:

$$\mathbf{I}\{x < 1\}$$

- Use `\ln` or `\log` to write the symbols for natural logarithm or decimal logarithm, it produces

$$1 = \ln(\exp(1)), \quad 1 = \log(10)$$

- Use `\operatorname{E}` to write the symbol for expectation, it produces

$$\operatorname{E}[X] = \mu$$



Using listings for source

Slides containing a listing also need [containsverbatim] as option.
For 'highlighting' of XploRe keywords see `listing.tex`.

```
1 library("metrics")
2 randomize(10178)
3 z=(uniform(n).>0.5)~(normal(n).<0.5)
```



Piecewise Uncovering I

The following example uses $\langle 1 - 2 \rangle$ commands to piecewise hide and uncover text. $\langle 1 - 2 \rangle$ makes the first item appear only on slides 1 and 2, $\langle 2 - \rangle$ has the second item visible from slide 2 onwards.

□ Itemize environments

(i) First Roman point.

Short Title - please modify the figure in the lower right corner:



Piecewise Uncovering I

The following example uses $\langle 1 - 2 \rangle$ commands to piecewise hide and uncover text. $\langle 1 - 2 \rangle$ makes the first item appear only on slides 1 and 2, $\langle 2 - \rangle$ has the second item visible from slide 2 onwards.

- Itemize environments
- can be uncovered or hidden

- (i) First Roman point.
- (ii) Second Roman point, uncovered on second slide.

Short Title - please modify the figure in the lower right corner:



Piecewise Uncovering I

The following example uses $\langle 1 - 2 \rangle$ commands to piecewise hide and uncover text. $\langle 1 - 2 \rangle$ makes the first item appear only on slides 1 and 2, $\langle 2 - \rangle$ has the second item visible from slide 2 onwards.

- can be uncovered or hidden

- piecewise.

- (i) First Roman point.

- (ii) Second Roman point, uncovered on second slide.

- (iii) Last Roman point.

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Piecewise Uncovering II

There is an easier way using `\item < +- >`

- Itemize environments

Short Title - please modify the figure in the lower right corner:



Piecewise Uncovering II

There is an easier way using \item < +- >

- ▣ Itemize environments
- ▣ can be uncovered or hidden

Short Title - please modify the figure in the lower right corner:



Piecewise Uncovering II

There is an easier way using \item < +- >

- ▣ Itemize environments
- ▣ can be uncovered or hidden
- ▣ piecewise.

Short Title - please modify the figure in the lower right corner:



Hiding text...

Text on the first slide.

Shown on all slides.

Short Title - please modify the figure in the lower right corner:



Hiding text...

Text on the first slide.

Shown on second and third slide.

- Still shown on 2nd and 3rd slide.

Shown on all slides.

Short Title - please modify the figure in the lower right corner:



Hiding text...

Text on the first slide.

Shown on second and third slide.

- Still shown on 2nd and 3rd slide.

- Shown on slides 3 and 5.

Shown on all slides.

Short Title - please modify the figure in the lower right corner:



Hiding text...

Text on the first slide.

☐ Shown from slide 4 on.

Shown on all slides.

Short Title - please modify the figure in the lower right corner:



Hiding text...

Text on the first slide.

- ☐ Shown from slide 4 on.
- ☐ Shown on slides 3 and 5.

Shown on all slides.

Short Title - please modify the figure in the lower right corner:



Further Information

Further Information can be found in the \LaTeX version of this document, where some more details are explained and important specifications are highlighted.

Suggestions to improve the style or the explanations are welcome!

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For Further Reading



Tobias Oetiker, Hubert Partl, Irene Hyna and Elisabeth Schlegl
The Not So Short Introduction to L^AT_EX2e
available on www.ctan.org, 2008



Scott Pakin
The Comprehensive L^AT_EX Symbol List
available on www.ctan.org, 2008



Frank Mittelbach and Michel Goossens
The L^AT_EX Companion – 2nd ed.
Addison-Wesley, 2004



For Further Reading



Mark Trettin and Jörgen Fenn

An essential guide to L^AT_EX2e usage
available on www.ctan.org, 2007



Wikipedia Wiki Books

LaTeX-Wörterbuch: InDeX
available on www.wikipedia.de



Till Tantau

User Guide to the Beamer Class, Version 3.07
available on www.sourceforge.net, 2007

