University of Western Sydney
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2019 FINAL EXAM

SUBMISSION PAPER FOR FINAL EXAMINATION

Introduction to Data Science (301033)

BSc(Math)

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24. 10. 2019

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1 Preamble

Load Packages etc.:

```
# Load Packages
if(require('pacman')){
  library('pacman')
}else{
  install.packages('pacman')
  library('pacman')
}
```

```
#  Loading required package: pacman
```

```
pacman::p_load(caret, scales, ggplot2, rmarkdown, shiny, ISLR, class, BiocManager, xtable,
               corrplot, plotly, tidyverse, latex2exp, stringr, reshape2, cowplot, ggpubr,
               rstudioapi, wesanderson, RColorBrewer, colorspace, gridExtra, grid, car,
               boot, colourpicker, tree, ggtree, mise, rpart, rpart.plot, knitr, MASS,
               magrittr, EnvStats,tidyverse,tidyr,devtools, bookdown, leaps, car, clipr,
               tikzDevice, e1071, ggbiplot, base)
#install.packages("ggbiplot")

mise()
```

```
set.seed(23)
# Set Working Directory
#setwd(dirname(rstudioapi::getActiveDocumentContext()$path))
# setwd(getSrcDirectory()[1])
```

2 My Section Header 1

Please see the documentation of RMarkdown for more details on how to write RMarkdown documents.

Download a testlogo from here: https://raw.githubusercontent.com/sebastiansauer/yart/master/docs/logo.png and uncomment the respective line in the header.

For finetuning of design options, please check the tex template. There you will find some variables such as `$classoption$`. Those variables may be addressed in the yaml header of the yart file.

2.1 My Section Header 2

"Lorem ipsum" dolor sit amet, consectetur adipiscing elit. Proin mollis dolor vitae tristique eleifend. Quisque non ipsum sit amet velit malesuada consectetur. Praesent vel facilisis leo. Sed facilisis varius orci, ut aliquam lorem malesuada in. Morbi nec purus at nisi fringilla varius non ut dui. Pellentesque bibendum sapien velit. Nulla purus justo, congue eget enim a, elementum sollicitudin eros. Cras porta augue ligula, vel adipiscing odio ullamcorper eu. In tincidunt nisi sit amet tincidunt tincidunt. Maecenas elementum neque eget dolor egestas fringilla:

> Nullam eget dapibus quam, sit amet sagittis magna. Nam tincidunt, orci ac imperdiet ultricies, neque metus ultrices quam, id gravida augue lacus ac leo.

Vestibulum id sodales lectus, sed scelerisque quam. Nullam auctor mi et feugiat commodo. Duis interdum imperdiet nulla, vitae bibendum eros placerat non. Cras ornare, risus in faucibus malesuada, libero sem fringilla quam, ut luctus enim sapien eget dolor.

- Aufzählungen (nummeriert oder nicht) sind möglich.
- Sonderzeichen werden unterstützt: äüß.
- LaTeXwird unterstützt.
- Und damit auch "schöne" Formeln: $e^{ln(e)} = e$ (stimmt das?).
- Ein Überblick zur **Markdown-Syntax** findet sich hier.
- Ein paar Gimmicks: H_2O, This ~~is deleted text.~~, feas*ible*, not feas*able*, lang—ganz lang.
- Use `\ts` as a shorthand for `\thinspace` to get "z. B." instead of "z. B." (thin space between the two letters)
- Footnotes are supported[1].
- Zitationen sind möglich, im beliebigen Format, z.B. APA6. Das Format wird über die Variable `cls` definiert (im Kopfteil oben). Die entsprechende Datei muss im gleichen Ordner liegen wie diese Rmd-Datei. Die Datei mit den bibliographischen Informationen wird über die Variable `bibliography` angegeben. Auch diese Datei muss sich im gleichen Ordner befinden wie diese Rmd-Datei.
- Besonders schön ist es, dass man R direkt einbinden kann über knitr. Hier findet sich eine gute Anleitung.

[1] Fußnoten sind bei Pandoc eine Art von Links.

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

3 R-Code

So bindet man R-Code ein:

```
x <- c(1,2,3)
mean(x)
```

```
#  [1] 2
```

4 Citation

Put the file with the references in the same folder as the rmd-file. Uncomment/insert a line in the yaml header such as `bibliography: bib.bib`, where `bib.bib` is the name of your bib-file. Similarly, if you want to format the citation in a certain style, put the respective csl-file in the same folder as this document and uncomment/insert this line in the yaml header: `csl: apa6.csl`, where `apa6.csl` is the style file.

Use this format for citation: `[\@bibtexkey]`. Put all the bibliography data in one bibliography file.

Don't forget to cite software and data. R and R packages can be cited in the following way:

```
citation()
citation("rmarkdown")
```

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5 Tabellen

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So erstellt man "von Hand" eine Tabelle in Markdown:

```
 Right     Left      Center      Default
-------     ------ ----------    -------
     12      12         12             12
    123      123        123           123
      1      1           1              1

Table: Table caption
```

Das ist das Ergebnis:

Table 1: Table caption

Right	Left	Center	Default
12	12	12	12
123	123	123	123
1	1	1	1

There are comfortable and powerful R packages available for rendering markdown tables such as Huxtable, or xtable, and other.

Table with R package `xtable`; note that this package needs to be installed to run this example.

```
data(mtcars)


library(xtable)
print.xtable(
  xtable(head(daten),
         label="tab:daten",
         caption="Datenstruktur für eine within-Analyse"),
  comment=FALSE)
```

```
kable(mtcars)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
Chrysler Imperial	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
Toyota Corona	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
Dodge Challenger	15.5	8	318.0	150	2.76	3.520	16.87	0	0	3	2
AMC Javelin	15.2	8	304.0	150	3.15	3.435	17.30	0	0	3	2
Camaro Z28	13.3	8	350.0	245	3.73	3.840	15.41	0	0	3	4
Pontiac Firebird	19.2	8	400.0	175	3.08	3.845	17.05	0	0	3	2
Fiat X1-9	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
Ford Pantera L	15.8	8	351.0	264	4.22	3.170	14.50	0	1	5	4
Ferrari Dino	19.7	6	145.0	175	3.62	2.770	15.50	0	1	5	6
Maserati Bora	15.0	8	301.0	335	3.54	3.570	14.60	0	1	5	8
Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

6 Figures

Use knit to insert images. Figures can be referenced, too.

```
knitr::include_graphics("/docs/picture2.png")
```

7 References

[If some literature is cited, it appears here]