

# BSDA: Assignment Template and Formating Instructions

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## General Information to include

Here general information is included that is needed for administrative/course purposes. Below is a list of the information that needs to be included under general information. **If the information below is missing in the report, the assignment will be failed.**

- **Time used for reading and self-study exercises:** [How long time took the reading assignment and the self-study exercises (in hours)]
- **Time used for the assignment:** [How long time took the basic assignment (in hours)]

- **Good with assignment:** [Write one-two sentences of what you liked with the assignment/what should we keep for next year.]
- **Things to improve in the assignment:** [Write one-two sentences of what you think can be improved in the assignment. Can something be clarified further? Did you get stuck on stuff that is not related to the content of the assignment etc.]

**NOTE!** The assignments will be graded anonymously. **Do not include your name anywhere in the assignment! If the name is included, the assignment will be failed.**

## Introduction

This rmd-file is a template with format instructions for Assignments in the BSDA course at Uppsala University. R markdown is a convenient way of writing exercise reports by combining text and R code using markdown syntax. To create your assignment, remove the formatting instructions, and use this file as a template. Keep the header (the first lines of this file between two lines of —). Set the author name to ‘Anonymous Student’, and set the title to match the assignment number.

R markdown makes it easy to make a structured document with section and subsection titles, textual explanations, equations, code, and figures in a logical order. When you make changes to the code and re-run the notebook or “knit” (render) it to PDF, the relevant code is re-run, and the figures and results are updated without the need to copy and paste (which is prone to errors).

For more information on how to use markdown, see **this** and more details on R markdown can be found **here**.

Also, *R Markdown: The Definite Guide*, a comprehensive book on R Markdown, can be found **here**.

## Loading R packages

Below are examples of how to load packages that are used in the assignment

```
library(ggplot2)
```

## Including source code

Try to avoid printing an excessive amount of code and think about what is essential to show how you got the result.

Write clear code. The code is also part of your report, and the clarity of the report affects if you pass the assignment. If the code is not self-explanatory, add comments. In a notebook, you can interleave explaining text and code.

If in doubt, additional source code can be included in an appendix.

## Including output

Sometimes, the code can be heavy to run. In those situations it is often much simpler to run the code in ordinary R and the copy the output into markdown. This can be done by simply add the argument `eval=FALSE`.

```
> 1 + 1
[1] 2
```

## Format instructions

All exercises in the assignment should start with a header fully specifying that it is exercise X and the question you are answering, as (in rmd use #):

### Exercise 1) Describe the concept of aleatoric uncertainty.

Subtasks in each assignment should be numbered and use header (in rmd use ##). Also include the question here. As an example:

#### a) What is a cumulative density function?

For each subtask, include a necessary textual explanation, equations, code, and figures so that the answer to the question flows naturally. You can think about what kind of report you would like to review.

## Code

We can easily add R code as chunks in the following way:

```
5 + 5
```

```
## [1] 10
```

This R code is evaluated when running the notebook or when rendering to PDF.

If you want to show and run the code, but the output is very long or messy, and you prefer to hide the output from the rendered report, you can use option `results='hide'`.

```
5 + 5
```

If you want to use some code in the notebook, but think it's not helpful for the teacher that grade your assignment, you can exclude it from the generated PDF with the option `include=FALSE`. You will see the next block in rmd, but not in the generated PDF.

## Plots

Include plots, where we can specify the width and height of the figure.

```
data("faithful")
plot(faithful$eruptions, faithful$waiting)
```

Or using `qplot` from `ggplot2` package

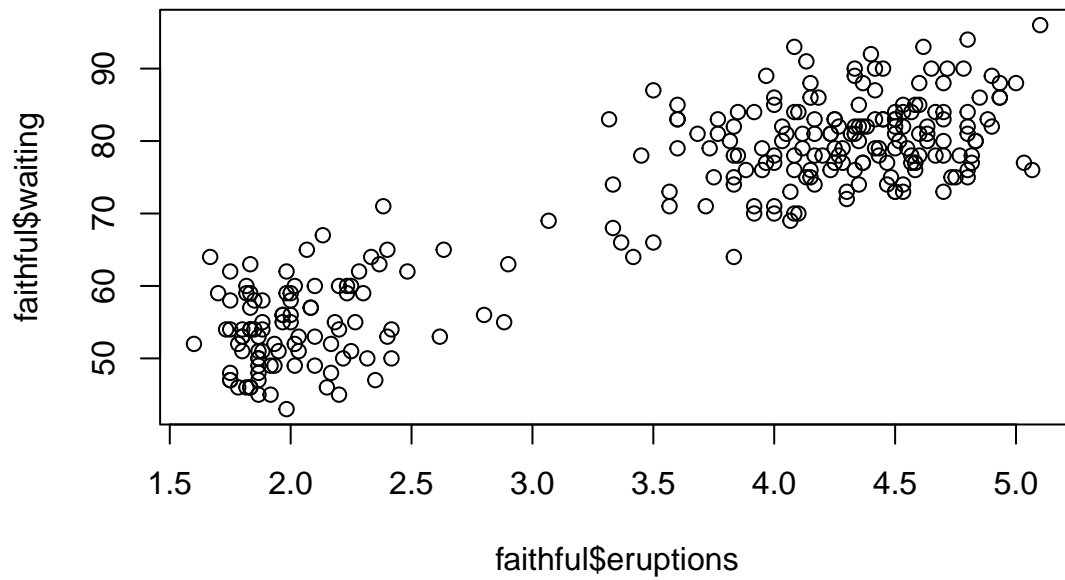
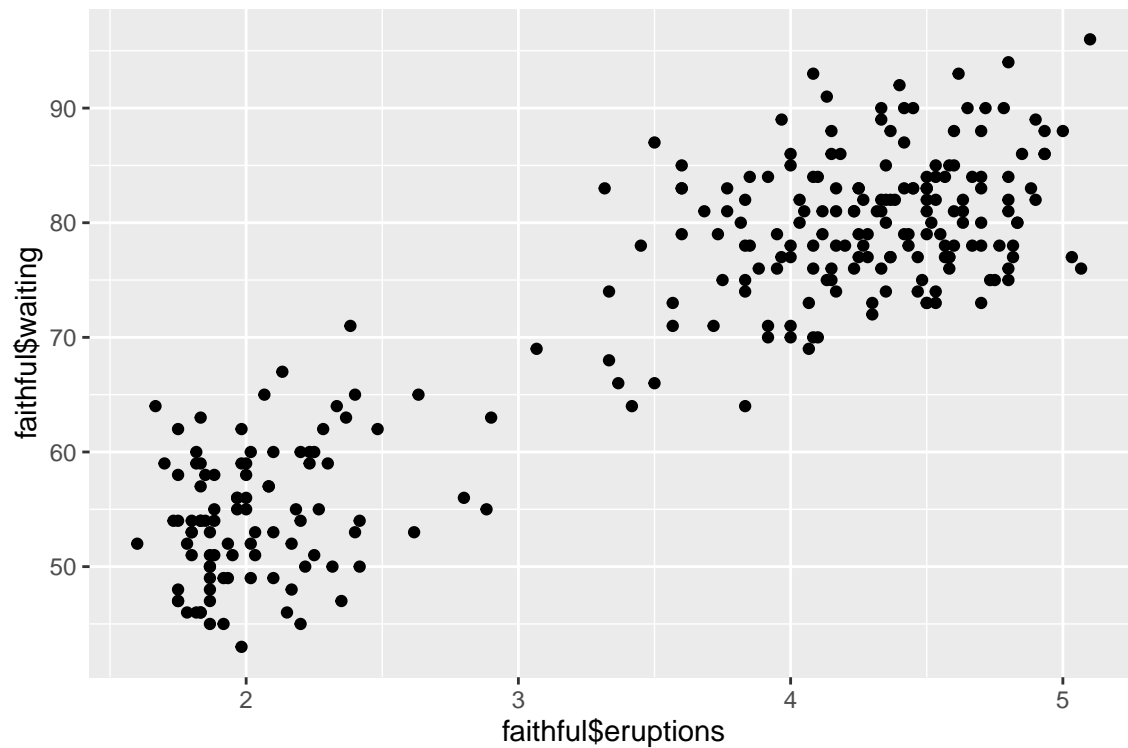


Figure 1: An example Figure.

```
library(ggplot2)
qplot(faithful$eruptions, faithful$waiting)
```

```
## Warning: 'qplot()' was deprecated in ggplot2 3.4.0.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.
```



Or using ggplot from ggplot2 package

```
ggplot(data=faithful, aes(x=eruptions, y=waiting)) + geom_point() +  
  labs(x='Eruption time in mins', y='Waiting time to next eruption (in mins)')
```

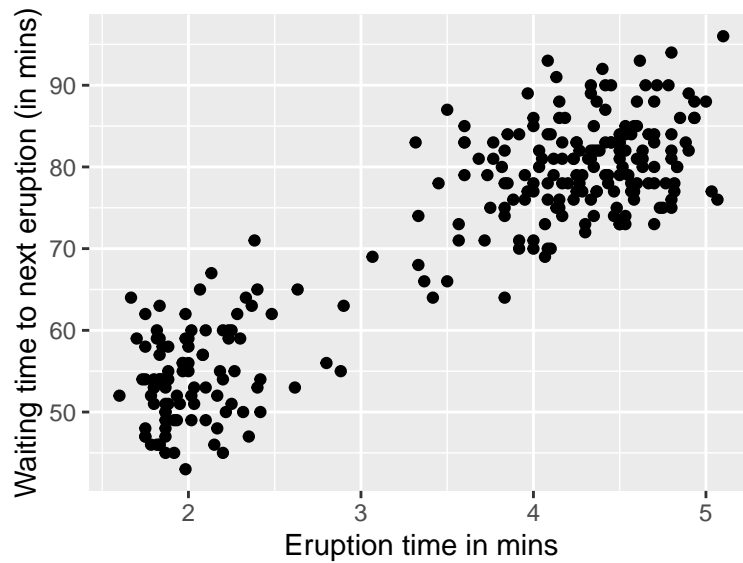


Figure 2: An smaller ggplot2 Figure.

## Images

You can include an existing image (e.g., scanned copy of pen and paper equations)



Figure 3: Uppsala University

or alternatively

```
knitr::include_graphics("files/uu_logo.png")
```



## Equations

You should write equations using LaTeX syntax, or you can include them as images if, for example, you use Microsoft Equations.

In Markdown, equations can easily be formulated using LaTeX in line as  $f(k) = \binom{n}{k} p^k (1-p)^{n-k}$ . Or use the `math` environment as follows:

$$\begin{array}{ccc} x_{11} & x_{12} & x_{13} \\ x_{21} & x_{22} & x_{23}. \end{array}$$

The above example also illustrated multicolumn ‘array’. An alternative way to make multiline equations with alignment is to use ‘aligned’ as follows;

$$\begin{aligned} y &\sim \text{normal}(\mu, 1) \\ \mu &\sim \text{normal}(0, 1). \end{aligned}$$

If you are new to LaTeX equations, you could use the `latex4technics` equation editor to create LaTeX equations to include in the report.

More information on using LaTeX in R markdown can be found in 2.5.3 in *R Markdown: The Definite Guide*.

A short introduction to equations in LaTeX can be found [here](#).

## Language

The language used in the course is English. Hence the report needs to be written in English.

## Jupyter Notebook and other report formats

You are allowed to use any format to produce your report. For example, you can use Jupyter Notebooks, as long as you abide by the instructions in this template.