Writing your thesis in R with ubcdown

Hosted by Victor Yuan

Trainee Omics Group Workshop
2022 March 2nd

Workshop setup and install

Download this repository as a zip file on your computer: https://github.com/wvictor14/ubcdown/tree/2022update

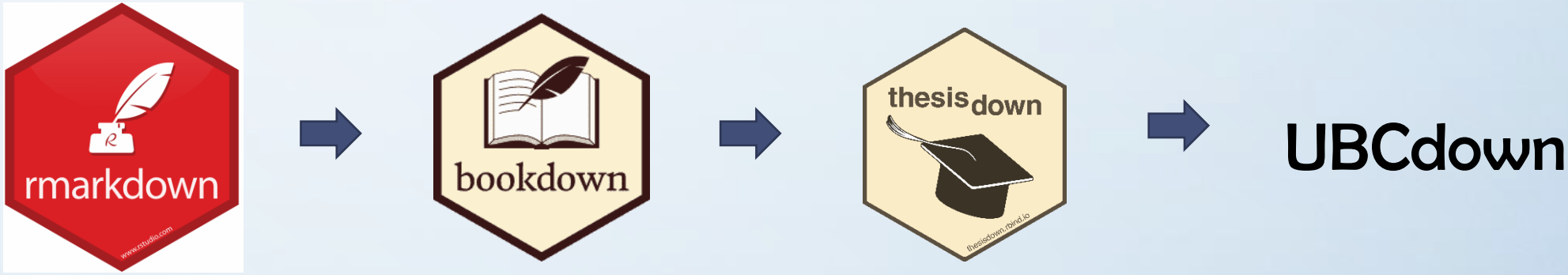
1. Click code -> download zip
2. Unzip and open the folder
3. Double click / open the ubcdown.Rproj file, this will open Rstudio
4. Install R packages:

```
install.packages(c('tinytex', 'rmarkdown', "knitr", "kableExtra","png","grid","dplyr","tibble", "readr“, “bookdown”))
tinytex::install_tinytex()
# restart Rstudio and then confirm that you have LaTeX with
tinytex:::is_tinytex()
```

5. Open main_script.Rmd, and click “knit”. The first time you knit, R will try and install all relevant LaTex packages
6. If it doesn’t knit, the error message may indicate some difficulty installing LaTex packages - you may need to manually install some LaText packages. See this https://bookdown.org/yihui/rmarkdown-cookbook/install-latex-pkgs.html

What is UBCdown

Write documents in R



https://bookdown.org/yihui/rmarkdown/
https://bookdown.org/yihui/bookdown/
https://github.com/ismayc/thesisdown
Original UBCdown template https://github.com/jepa/ubcdown
My 2022 update - https://github.com/wvictor14/ubcdown/tree/2022update

Why use R to write your thesis

Save TIME

Develop SKILLS and EXPERIENCE

- Forget about thesis structure and formatting
  - Low memory usage
  - Easily use citations, figures, and tables

- Gain programming skills in R, rmarkdown, latex
- Contribute to the UBCdown community

Why NOT to use R to write your thesis

- UBCdown is not guaranteed to meet guidelines, use at your own risk
- Lack of support for troubleshooting UBCdown

Getting help tips:

Google "How to do X in thesisdown/bookdown/rmarkdown"
Consult overleaf for LaTex support: https://www.overleaf.com/learn/latex/
Post issues on github repos ubcdown or thesisdown

Structure

main_script.rmd

Compiles rmd files from Sections/…rmd to create pdf

Images

Can put figures here

Tables

Can put tabular files here, recommend .csv, .txt, .tsv

Sections

Contains rmds where you write content

References

Put your references in a .bib file

main_script.rmd

Only edit to:

- Change titles of chapters
- Add new sections (like additional data chapters)
- Add new R packages
- Set global knitting and LaTex / formatting options
  - E.g. Citation style

Day to day

Here is what the process is like of working on your thesis in R

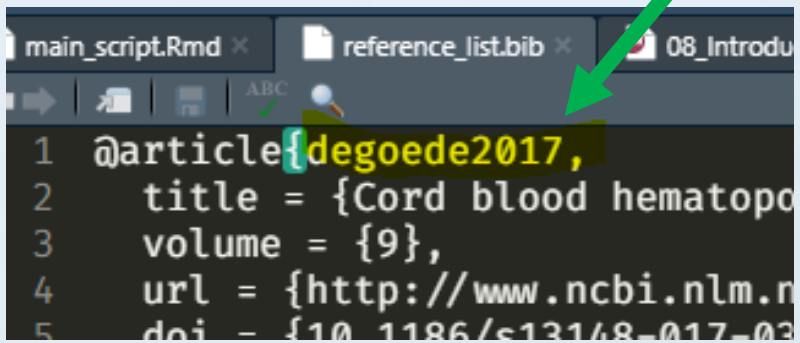
- Write content in rmd and save when done
- To view changes, knit main_script.rmd

Citations

References/

- Reference_list.bib – where you put your citations
- Citation style .csl – Can download from Zotero / internet

Every entry in .bib has a "key", that you can use to reference in-text



This is how you reference in-text:
[@degoede2017]

Will be rendered as:

Citations

.bib and .csl file specified in YAML frontmatter of main_script.Rmd

To add references, you need to obtain a .bib file (Zotero, Mendeley, some online journals will allow downloading a .bib)

Open the downloaded .bib in notepad, copy and paste entries into references_list.bib

Similarly, you can change citation styles by downloading .csl files from Zotero, or the web

Referencing figures: overview

Steps:

1. Load figure with an rmarkdown chunk
2. Can now use in-text references
3. List of Figures section automatically populates

Referencing figures: details

In-text references:

"This text needs a reference to \@ref(fig:FIGURETITLE)"

Somewhere in the rmd document, insert a corresponding rmd code chunk:

Referencing figures: details

"fig" (figure) or "tab" (table)

"This text needs a reference to \@ref(fig:introfig1)"

Reference w/ code chunk title

```
```{r introfig1, eval = T, echo = T, echo = F,
fig.cap = "(ref:introfig1-cap)",
fig.scap = "Structure of the placenta and chorionic villi",
fig.align = 'center',  out.extra = ‘’}
```

Or ‘left’, right’

The title that appears in the “List of Figures” section

```
knitr::include_graphics(
    here::here('images’,
               'introduction’,
               'GDG-placenta-diagram.pdf’))
```

This is the filepath to the image (pdf, png, tiff, etc.) from the top level directory
```

Referencing figures: details

```
```{r introfig1, eval = T, echo = T, echo = F,
fig.cap = "(ref:introfig1-cap)", … }

…
…
```

Figure caption

- Can be long (e.g. a paragraph)
- Sometimes requires special features, e.g. citations

Solution: write the caption outside of the rmd chunk

(ref:introfig1-cap) schematic representation of the placenta (left), …
From Del Gobbo 2021 [@delgobbo2021], … .
```

an example

In-text reference:

1.2 Placental function

The placenta is an essential organ that develops from the embr
pregnancy (Figure 1.1). Sometimes described as a "vascular o
establishment and regulation of maternal-fetal blood flow. Mater

Auto-add to List of Figures:

List of Figures

Figure + fig. caption

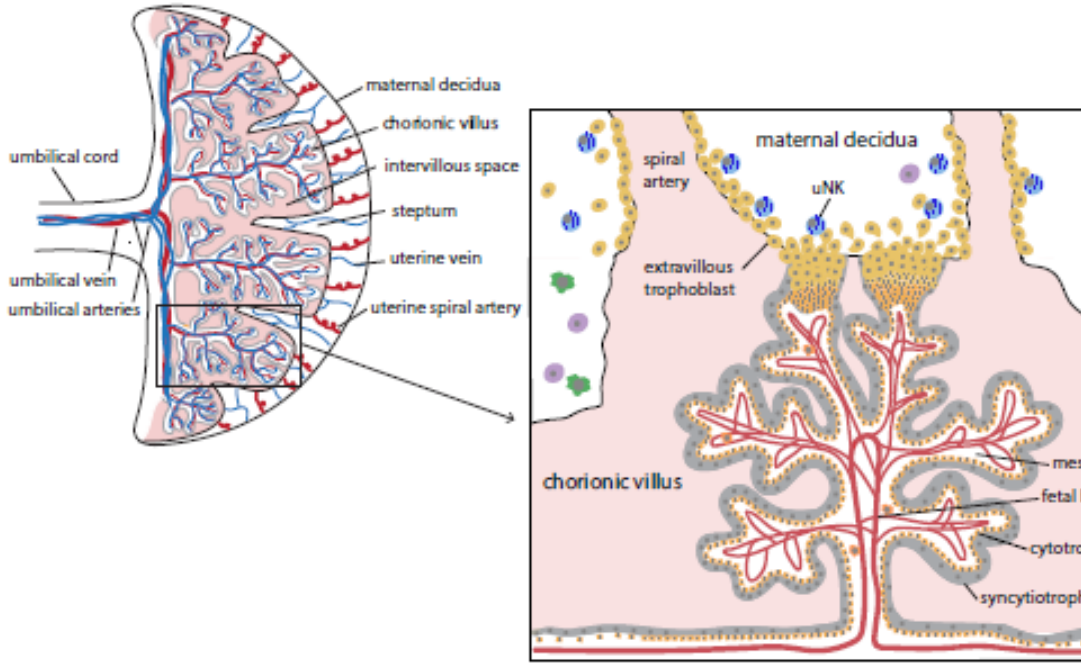


Figure 1.1: Schematic representation of the organization of the placenta (left), which is embed
maternal uterus. It is organized into branched chorionic villi that contain the fetal vasculatur
connect to the fetus via the umbilical vein and arteries. The villi are bathed by maternal blood
in the intervillous space, delivered by the uterine spiral arteries. Representation of a chorionic vi
composed of the outer syncytiotrophoblast and inner cytotrophoblast cell layers, inner mesenchym
blood vessels. The villus is anchored to the maternal decidua, and extravillous trophoblast cells m
invade the maternal decidua, where they interact with resident maternal immune cells such as
natural killer cells (uNK), and remodel the uterine spiral arteries. From Del Gobbo 2021 (15), U
British Columbia, Vancouver, Canada. Original image adapted from Del Gobbo 2019 (16). Copy
by Springer-Verlag GmbH Germany, part of Springer Nature. Reprinted with permission.

Developmentally, DNAm is highly dynamic and serves as an important mark that is repr
for the generation and establishment of new genomes (Figure 1.2). DNAm is first erased during t
tion of primordial germ cells, owing to actions of TET enzymes that convert 5' methyl-cytosine (
hydroxymethyl-cytosine (5'hmc), and also to passive dilution through successive replicative even

Tables

General idea is same as for figures:

load the table in an rmd chunk and print it

We use the R package kable to print, which offers many useful features

- e.g. captions, footnotes, headers, column widths, row widths, multi-page tables etc.

In-text references to tables operate the same way, using the code chunk label