Reproducible Research: with R, Renv and LaTeX

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Presenter's Assumptions

- You have R and RStudio installed (ideally the latest versions)
- You know how to install R packages
- You have an 'open' mind
- You know how to use a computer (Cheesy I know, but very important to mention)

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Links to software/packages:

1. R : https://cran.rstudio.com/
2. RStudio : https://www.rstudio.com/products/rstudio/download/
3. LaTeX : https://www.latex-project.org/get/
4. TinyTeX : https://yihui.org/tinytex/
5. renv : https://rstudio.github.io/renv/articles/renv.html
6. knitR : https://yihui.org/knitr/
7. Overleaf : https://www.overleaf.com/

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Disclaimer

"If we knew what it was we were doing, it would not be called research, would it?" ... Albert Einstein

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- LaTeX is a document preparation software developed by Leslie Lamport in the early 1980s[1].
- LaTeX uses the TeX typesetting system originally designed and written by Donald Knuth[2]
- There are various LaTeX distributions for most major operating systems which combine the LaTeX and editors e.g. MacTeX(MacOS), MikTeX(Windows) and Overleaf(Online)

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[1]https://en.wikipedia.org/wiki/LaTeX
[2]https://en.wikipedia.org/wiki/TeX

Like every piece of software LaTeX has several advantages:

- LaTeX is just text; anyone can edit your file[3]
- The document is automatically formated
- Makes beautiful documents
- Very good with math and symbols
- Can intergrate separate PDF documents neatly

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[3]https://academia.stackexchange.com

Unfortunately LATEX is not as popular as some 'WYSIWYG' editors like MSWord due to some of the following:

- Fairly steep learning curve
- Collaborators unfamiliar with LaTeX will have difficulty reviewing your manuscripts
- Many features require libraries, which you have to find/be made aware of (view changes, etc)
- Layout changes are difficult (i.e., will require time for you to hunt down solution and implement it)[4]

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[4]https://academia.stackexchange.com

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What is TinyTeX

TinyTeX[a]

- A custom LATEXdistribution based on TEXLive that is small in size but still functions well in most cases.

- missing packages will just be installed automatically.

- if you create RMarkdown in PDF then you may have used LATEXand tinytex without knowing they existed.

- An R package installed using: **install.packages("tinytex")**

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[a]https://yihui.org/tinytex/

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What is Renv

renv[a]

- R dependency and library paths management to isolate your projects.
- renv 'freezes' your project workspace so that your existing workflows in future will just work as they did before
- very important for collaboration(especially with the future you)

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[a]https://rstudio.github.io/renv/articles/renv.html

The recomended workflow for renv is[5]:

- Call *renv::init()* to initialize a new project-local environment with a private R library,
- Work in the project as normal, installing and removing new R packages as they are needed in the project,
- Call *renv::snapshot()* to save the state of the project library to the lockfile (called renv.lock),
- Call *renv::snapshot()* again to save the state of your project library if you change any packages successfully, or call *renv::restore()* to revert to the previous state

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[5]hrefhttps://rstudio.github.io/renv/articles/renv.htmlAdapted from here

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knitR[a]

- knitR is a general-purpose literate programming engine, with lightweight API's designed to give users full control of the output without heavy coding work.

- It is the magic behind RMarkdown document rendering

- knitR 'weaves' **.R** files into a **.tex** file then **.pdf**
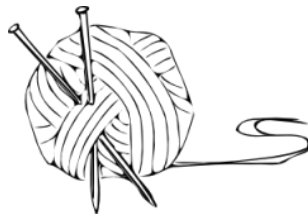
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[a]https://yihui.org/knitr/

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What is Overleaf

Overleaf[a]

- Online LATEXeditor.
- Collaboration features
- Track changes
- GitHub integration
- Basic R integration *(uses only base R libraries)*
- Easy learning with integrated documenation
- It is the 'RStudio' of LATEX in my opinion

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[a]https://www.overleaf.com

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THE END : Questions?