Reproducible Reporting with RMarkdown (R3)

Mar. 2022

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Preface

Motivation for Reporting Task

Robust Research:

- “Robust research is about doing small things that stack the deck in your favor to prevent mistakes.”
  —Vince Buffalo, author of Bioinformatics Data Skills (2015)

Reproducible Research:

- Reproducible research can be repeated by other researchers with the same results

Interactive Reporting:

- Apart from paper or PDF reports, allowing users to interact with the report allows them to ask questions about the data itself

Requirements for Reporting

Distributable:

- Self-contained report that makes it easier to get feedbacks

Viewable to Anyone:

- Viewable to non-engineers in order to eliminate information asymmetry
  e.g.) In most cases, JupyterLab can only be accessed by engineers

Automate Reporting:

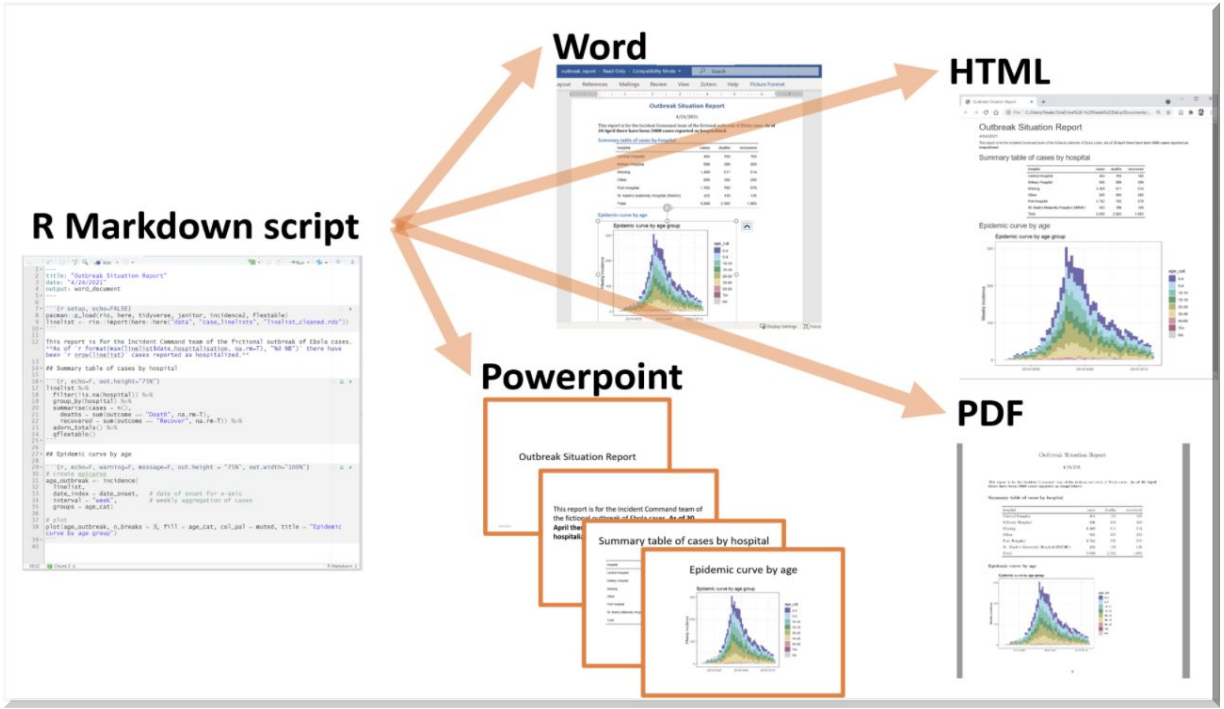
- Reporting task should be done at the same time as analysis task
- Preliminary analytical design becomes more important

02

What's RMarkdown?

What's RMarkdown?

RMarkdown is a widely-used tool for creating automated, reproducible, and share-worthy outputs, such as reports (html, pdf, docx, ...)



[Source]

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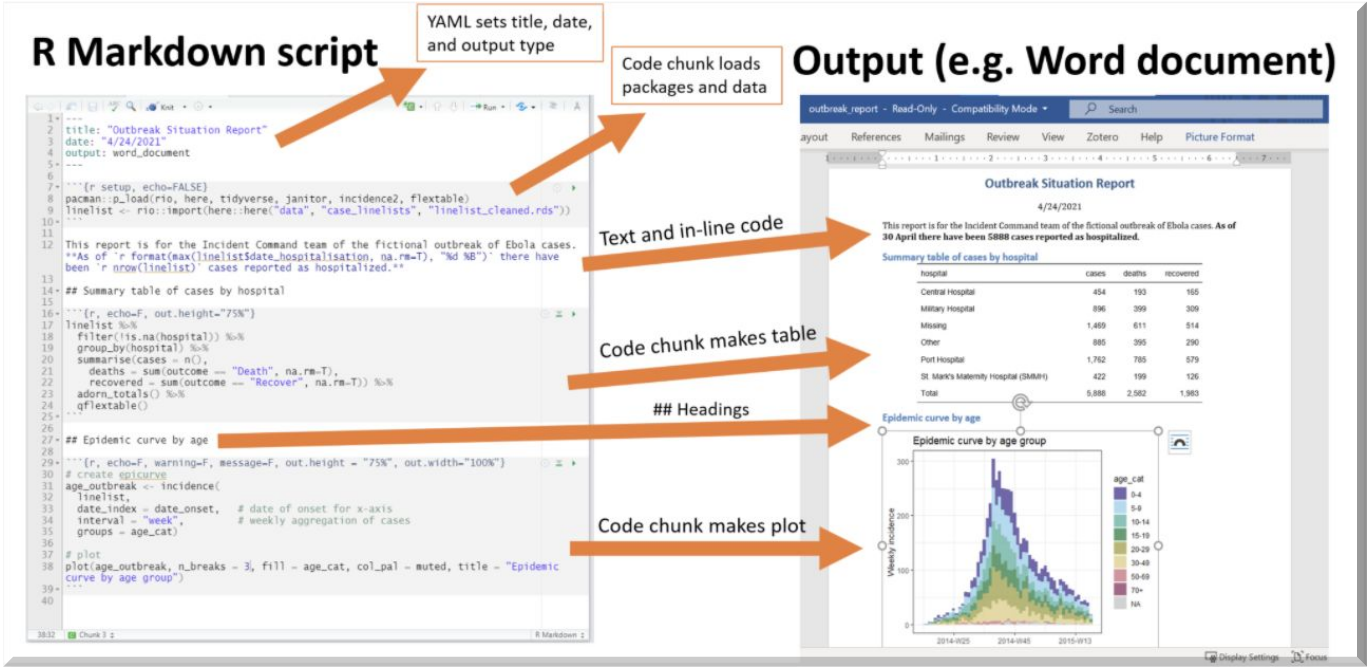


[Source]

Benefits of RMarkdown

Easy to Deliver:

- We can distribute html reports. Other formats (pdf, docx) are available
- Can be attached to ESA (up to 10MB by default)

Easy to Reproduce:

- Easy to recreate the report if the report data is updated
- We can easily create reports if know Markdown

Rich Expression:

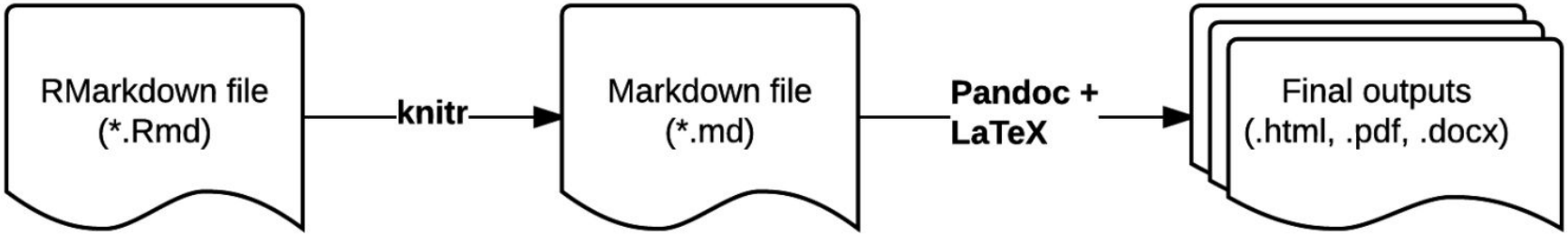
- Interactive report (only html format)
- Ingenuities that can aggregate information, such as Tab / Table display

03

How to make reports with RMarkdown

RMarkdown Workflow: [Link]

- RMarkdown is an enhanced version of Markdown that lets you embed R code into the docs
- .Rmd → .md → Document(.html/.pdf/.docx)



Creation example by R

- Prepare 2 type of files for report contents(.Rmd) and rendering(.R)

Report contents(.Rmd)

````
# Let's embed some R code
```{r}
library(dplyr)
library(readr)
gm <- read_csv('data/gapminder.csv')
```

The mean life expectancy is
`r mean(gm$lifeExp)` years.

The years surveyed in this data include:
`r unique(gm$year)`.
````

Rendering(.R)

```
library(rmarkdown)

rmarkdown::render(
        input=input_file_Rmd,
        output_format="html_document",
        output_file=output_file,
        encoding='utf-8',
        quiet=F)
```

Call R from Python

- We can easily call R from Python

```
import os
os.system("Rscript ./render.R --arg1=xxx --arg2=yyy, ...")
```

- We can also use R with Google Colaboratory, just adding below

```
[ ]  # activate r magic
     %load_ext rpy2.ipython
```

```
[ ]  %%R
     Sys.setenv(TZ="Asia/Tokyo")
     install.packages('argparse')
     install.packages('rmdformats')
     install.packages('formattable')
     install.packages('DT')
```

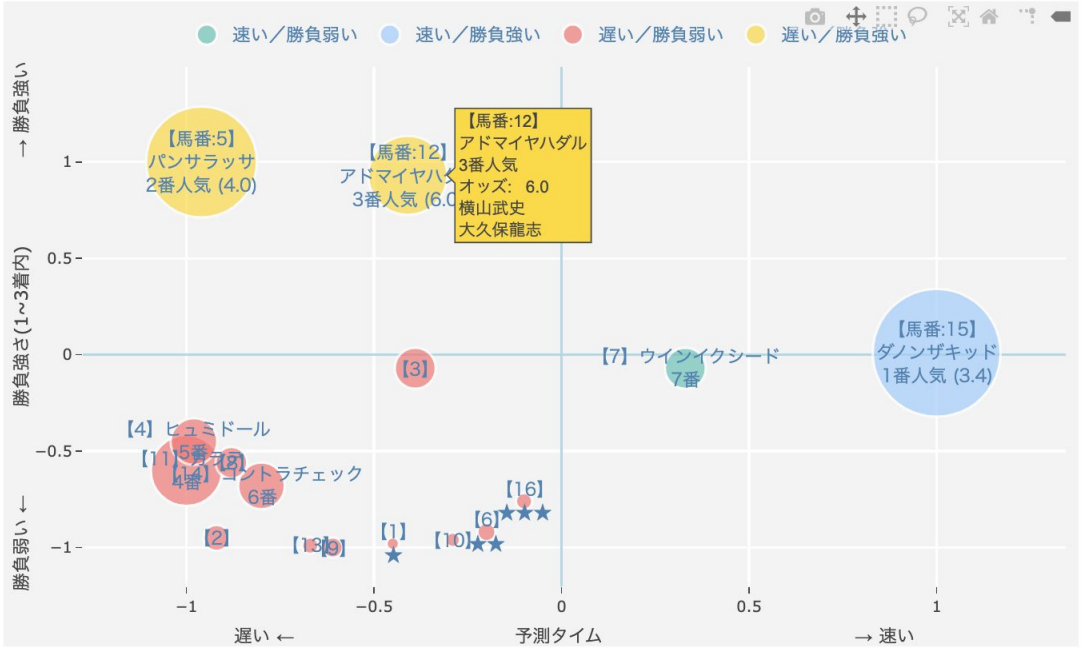
04

Report Examples

Ex.1) Horse Racing Prediction(1/4): [Link]

Visualize the prediction scores of spped (x-axis) and clutch (y-axis)

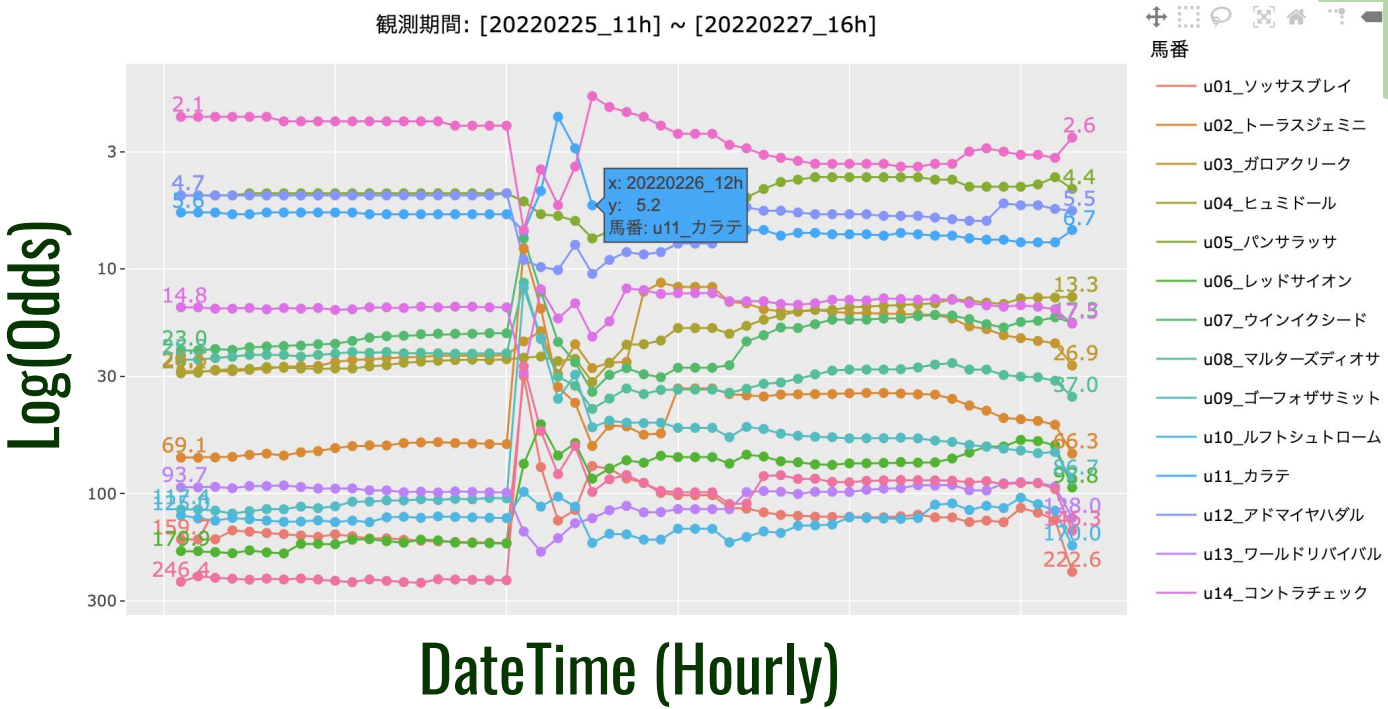
Prediction Chart (Speed/Clutch)



Ex.1) Horse Racing Prediction(2/4): [Link]

Odds information will be updated hourly until just before the race

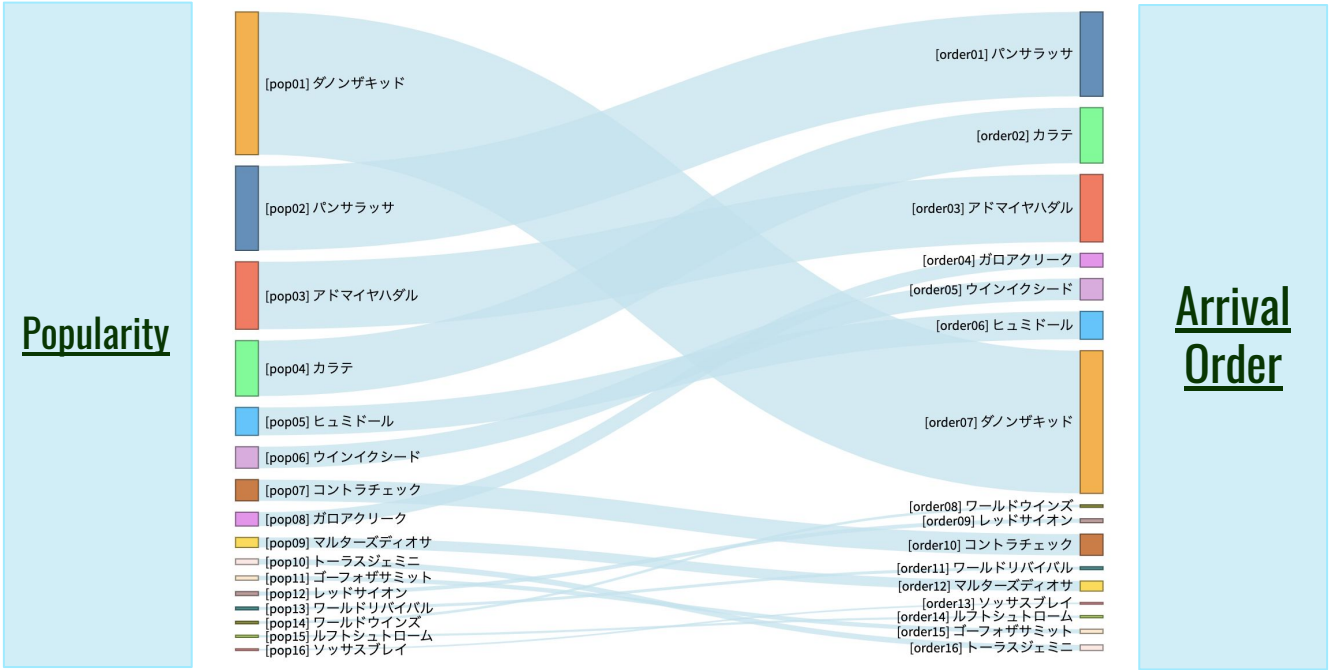
Monitoring Odds (Hourly)



Ex.1) Horse Racing Prediction(3/4): [Link]

Visualize the discrepancy between popularity and arrival order as a back test

Popularity vs Arrival Order



Ex.1) Horse Racing Prediction(4/4): [Link]

Visualize the order of passing corners, as the race development can be imagined

The Order of Passing Corners

Ex.2) Machine Learning Glossary: [Link]

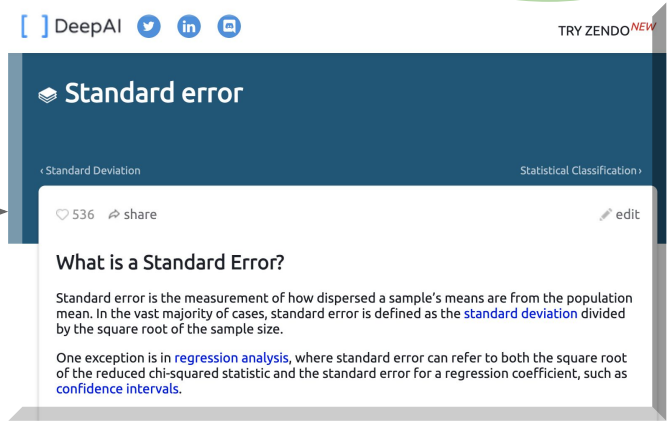
Create a table report for each category by scraping the glossary

【Regression Analysis (3)】 【Response Variable (3)】 【Sigmoid Function (3)】 【z-score (3)】

【Regression Analysis (3 terms)】

Show 5 entries Search:

No	Term	trunc-summary	tag	date
All	All	All	All	All
151	Standard error	Standard error is the measurement of how dispersed a sample's means are from the population mean.	Regression Analysis / Standard Deviation / Confidence Interval	05/17/2019
160	Heteroscedasticity	Heteroscedasticity refers to data for which the variance of the dependent variable is unequal across the range of independent variables.	Regression Analysis / Variance	05/17/2019
192	F-Distribution	The F distribution is a right-skewed distribution used commonly in another statistical test called an Analysis of Variance (ANOVA).	Probability / Regression Analysis / Variance	05/17/2019



Ex.3) Leaflet Map: [Link]

Scraping the addresses of medical institutions and put it on the map

【05_小児科 (79件)】 【06_産婦人科 (22件)】 【07_眼科 (35件)】 【08_耳鼻科 (25件)】 【09_歯科 (253件)】
【10_精神科 (20件)】

References

- [R Markdown: The Definitive Guide]
- [Reproducible Reporting with RMarkdown]
- [SportSciData]
- [Smart and Interactive Documents]
- [40 Reports with R Markdown]
- [Tools for Reproducible Research]


End of Document