Reports, Slides and Dashboards with R

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We will learn how to create

- Scientific reproducible reports, books, papers…
- Slides
- Statistical Dashboards

With only FREE tools

LaTeX

- Download Miktex (for Widows users) and Mactex (for Mac users)
- Online and collaborative tools : Overleaf and Sharelatex

Overleaf

- Create your own account
- For your first document choose one template and change it! (Here's a demo)
- We will show:
  - *How to add a figure and a table: Caption, position in the text, reference and labels?*
  - *How to add Bibliography: .bib file, several options: bibtex code: Jabref (for windows users) and Bibdeck (for Mac users) Or Google scholar*

`rmarkdown`: Examples:

- Document
  - *HTML (for websites)*
  - *PDF (in Latex)*
  - *Word document*

`rmarkdown`: Examples:

- Presentation
  - *HTML: 2 types isoslides and slidy*
  - *PDF: beamer presentations*
  - *PowerPoint (see Example below)*

`rmarkdown`: Examples:

- From template
  - *Revealjs (Presentation)*
  - *Tufte (HTML and PDF)*
  - *Bioconductor (PDF)*
  - *Flexdashboard*

Flexdashboard (from Template)

- YAML

```
 ---
title: "rbokeh iris dataset"
author: "Ryan Hafen"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    social: menu
    source_code: embed
---
```

- Loading packages that will be used

```
library(rbokeh)
library(flexdashboard)
```

Flexdashboard (from Template)

- Part 1
  - *Declare the column*

```
Column {data-width=600}
-----------------------------------------------------------------------
```

```
+ Make your plot
```

```
figure(width = NULL, height = NULL) %>%
  ly_points(Sepal.Length, Sepal.Width, data = iris, color = Species)
# figure() %>%
#   ly_points(Sepal.Length, Sepal.Width, data = iris,
#     color = Species, glyph = Species)
```

Flexdashboard

Species

Species (Quantile)
Petal Width

Flexdashboard (from Template)

- Part 2
  - *Declare 2nd column*

```
Column {data-width=400}
-----------------------------------------------------------------------
```

- Figure 2

```
figure(width = NULL, height = NULL, legend_location = "top_left") %>%
  ly_quantile(Sepal.Length, group = Species, data = iris)
```

and

```
figure(width = NULL, height = NULL) %>%
  ly_points(Sepal.Length, Sepal.Width, data = iris,
    color = Petal.Width)
```

Flexdashboard with Shiny app

- YAML

```
---
title: "Iris K-Means Clustering"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    social: menu
    source_code: embed
runtime: shiny
---
```

- Loading packages

```
library(datasets)
data(iris)
```

Flexdashboard with Shiny app

Column

X Variable

Sepal.Length

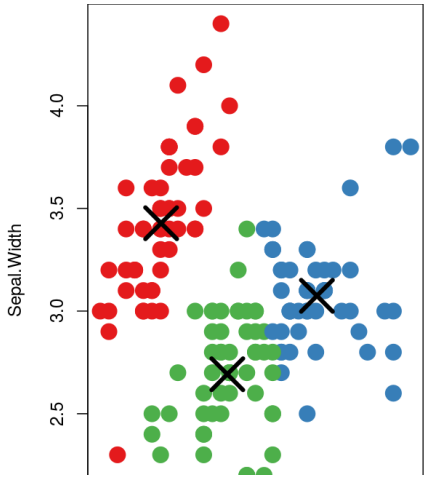
Y Variable

Sepal.Width

Cluster count

3

K Means



Flexdashboard with Shiny app (sidebar panel)

- Declaring the sidebar

```
Column {.sidebar}
-----------------------------------------------------------------------
```

- Input part (UI)

```
selectInput('xcol', 'X Variable', names(iris))

selectInput('ycol', 'Y Variable', names(iris),
               selected=names(iris)[[2]])

numericInput('clusters', 'Cluster count', 3,
             min = 1, max = 9)
```

Flexdashboard with Shiny app (Main panel)

- Declaring the Main panel

```
Column
-----------------------------------------------------------------------
```

- Displaying result

```
palette(c("#E41A1C", "#377EB8", "#4DAF4A", "#984EA3",
  "#FF7F00", "#FFFF33", "#A65628", "#F781BF", "#999999"))

# Combine the selected variables into a new data frame
selectedData <- reactive({
  iris[, c(input$xcol, input$ycol)]
})

clusters <- reactive({
  kmeans(selectedData(), input$clusters)
})

renderPlot({
  par(mar = c(5.1, 4.1, 0, 1))
  plot(selectedData(),
       col = clusters()$cluster,
       pch = 20, cex = 3)
  points(clusters()$centers, pch = 4, cex = 4, lwd = 4)
})
```

Power Point with R (Example)

- Installing packages:

```
> library(devtools)
> devtools::install_github('davidgohel/ReporteRsjars')
> devtools::install_github('davidgohel/ReporteRs')
```

- Loading the packages

```
> library(ReporteRs)
> library(haven)
> library(vcd)
> library(ggplot2)
> library(reshape2)
```

Power Point with R (Example)

- Importing data (It can be downloaded in this [link])("http://wiki.q-researchsoftware.com/images/9/94/GSSforDIYsegmentation.sav)

```
> dat<-read_sav("GSSforDIYsegmentation.sav")
```

- Now we give a name to the PPTX file and a Title to the presentation

```
> filename = "mypresentation.pptx"
> mypresentation= pptx(title = "Significant crosstabs")
```

Power Point with R (Example)

- Creating first slides : They contain mosaic-plots with the variable `privbiz` on the dependent variables:

```
dependent.variable.names = c("wrkstat", "marital", "sibs", "age", "educ")
```

- Write a function for the mosaic-plot.

```
DrawMP<-function(v1,v2){
  l1 = attr(v1, "label")
  l2 = attr(v2, "label")
  l1a = attr(v1, "labels")
  l2a = attr(v2, "labels")

  l1a=l1a[l1a%in%na.omit(unique(v1))]
  v1a=mapvalues(as.factor(v1),from=na.
                omit(unique(v1)),to=names(l1a))

  l2a=l2a[l2a%in%na.omit(unique(v2))]
  v2a=mapvalues(as.factor(v2),
                from=na.omit(unique(v2)),to=names(l2a))

  x = xtabs(~v1a + v2a)
  x = x[rowSums(x) > 0, colSums(x) > 0]
  ch = chisq.test(x)
  crosstab = prop.table(x, 2) * 100
  melted = melt(crosstab)
  melted$position = 100 - as.numeric(apply(crosstab, 2, cumsum) - 0.5 * crosstab)
  p = ggplot(melted, aes(x = v2a, y = value,fill = as.factor(v1a))) + geom_bar(stat='identity')
  p = p + geom_text(data = melted, aes(x = v2a, y = position, label = paste0(round(value, 0),"%")), size=4)
  p = p + scale_fill_manual(l1,values = rainbow(length(l1a)))
  p = p + labs(x = l2, y = l1)+theme_bw()
  colnames(crosstab) = paste0(colnames(crosstab), "%")
  list(graph=p,crosstab=crosstab,chisqtest=ch)
}
```

Power Point with R (Example)

- Computing the first mosaic-plot

```
> v1=dat$privbiz
> v2=dat$marital
> X=DrawMP(v1,v2)
> l1 = attr(v1, "label")
> l2 = attr(v2, "label")
```

Power Point with R (Example)

- Adding first graph and table to the Slide 1

```
> filename = "mypresentation.pptx" # the mypresentation to produce
> mypresentation = pptx(title = "Significant crosstabs")
> mypresentation = addSlide(mypresentation,
+                           slide.layout = "Title and Content" )
> mypresentation = addTitle(mypresentation,
+                            paste0("Standardized residuals and chart: ",
+                                   l1, " by ", l2))
> mypresentation = addPlot(doc = mypresentation,
+                          fun = print, x = X$graph,
+                          offx = 3, offy = 1, width = 6,
+                          height = 5 )
> mypresentation = addFlexTable(doc = mypresentation,
+                               FlexTable(round(X$chisqtest$stdres, 1),
+                                         add.rownames = TRUE),
+                               offx = 8, offy = 2,
+                               width = 4.5, height = 3 )
```

Power Point with R (Example)

- Saving the PPTX document

```
> writeDoc(mypresentation, file = filename )
> file.exists(filename)
[1] TRUE
```

- Go to the work directory and you will the file `mypresentation.pptx`.

Plots in LaTeX format: `tikzDevice`

We want to change this figure into LaTeX code

```
> library(ggpubr)
> data("ToothGrowth")
> df <- ToothGrowth
> ggboxplot(df, x = "dose", y = "len", width = 0.8)
```

```
> library(tikzDevice)
>  tikz("fig.tex",standAlone=TRUE)
> ggboxplot(df, x = "dose", y = "len", width = 0.8)
Measuring dimensions of: \char77
Measuring dimensions of: \char100
Measuring dimensions of: \char111
....
> dev.off()
null device
          1
```

Plots in LaTeX format: `tikzDevice`

Latex file is created in your work directory

```
% Created by tikzDevice version 0.10.1 on 2017-11-21 18:43:00
% !TEX encoding = UTF-8 Unicode
\documentclass[10pt]{article}
\usepackage{tikz}

\usepackage[active,tightpage,psfixbb]{preview}

\PreviewEnvironment{pgfpicture}

\setlength\PreviewBorder{0pt}
\begin{document}

\begin{tikzpicture}[x=1pt,y=1pt]
\definecolor{fillColor}{RGB}{255,255,255}
.... # truncated output.
```

HTML tables: DT package

```
> install.packages('DT')
> library(DT)
> datatable(iris, options = list(
+   searching = FALSE,
+   pageLength = 5,
+   lengthMenu = c(5, 15, 35, 50)
+ ))
```

HTML tables: DT package

Show 5 entries

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5	3.6	1.4	0.2	setosa

Showing 1 to 5 of 150 entries

Previous 1 2 3 4 5 … 30 Next

DT tables with options: color in one column

```
> datatable(iris, options = list(pageLength = 5)) %>%
+   formatStyle('Sepal.Length',  color = 'red', backgroundColor = 'orange', fontWeight = 'bold')
```

DT tables with options: color in one column

Show 5 entries Search:

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5	3.6	1.4	0.2	setosa

Showing 1 to 5 of 150 entries Previous 1 2 3 4 5 … 30 Next

Adding buttons to download the table

```
> datatable(
+   iris, extensions = 'Buttons', options = list(
+     dom = 'Bfrtip',
+     buttons = c('copy', 'csv', 'excel', 'pdf', 'print')
+   )
+ )
```

Adding buttons to download the table

Copy CSV Excel PDF Print

Search:

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5	3.4	1.5	0.2	setosa
9	4.4	2.9	1.4	0.2	setosa
10	4.9	3.1	1.5	0.1	setosa

Showing 1 to 10 of 150 entries

Previous 1 2 3 4 5 … 15 Next

Reordering columns

You can click and drag the table header to move a certain column to a different place

```
> datatable(iris2, extensions = 'ColReorder', options = list(colReorder = TRUE))
```

Reordering columns

Show 10 entries Search:

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5	3.4	1.5	0.2	setosa
9	4.4	2.9	1.4	0.2	setosa
10	4.9	3.1	1.5	0.1	setosa

Showing 1 to 10 of 150 entries Previous 1 2 3 4 5 … 15 Next

More ressources on `DT` package

- http://rstudio.github.io/DT/extensions.html
- https://blog.rstudio.com/2015/06/24/dt-an-r-interface-to-the-datatables-library/
- `googleVis`

HTML table with `sjPlot` package

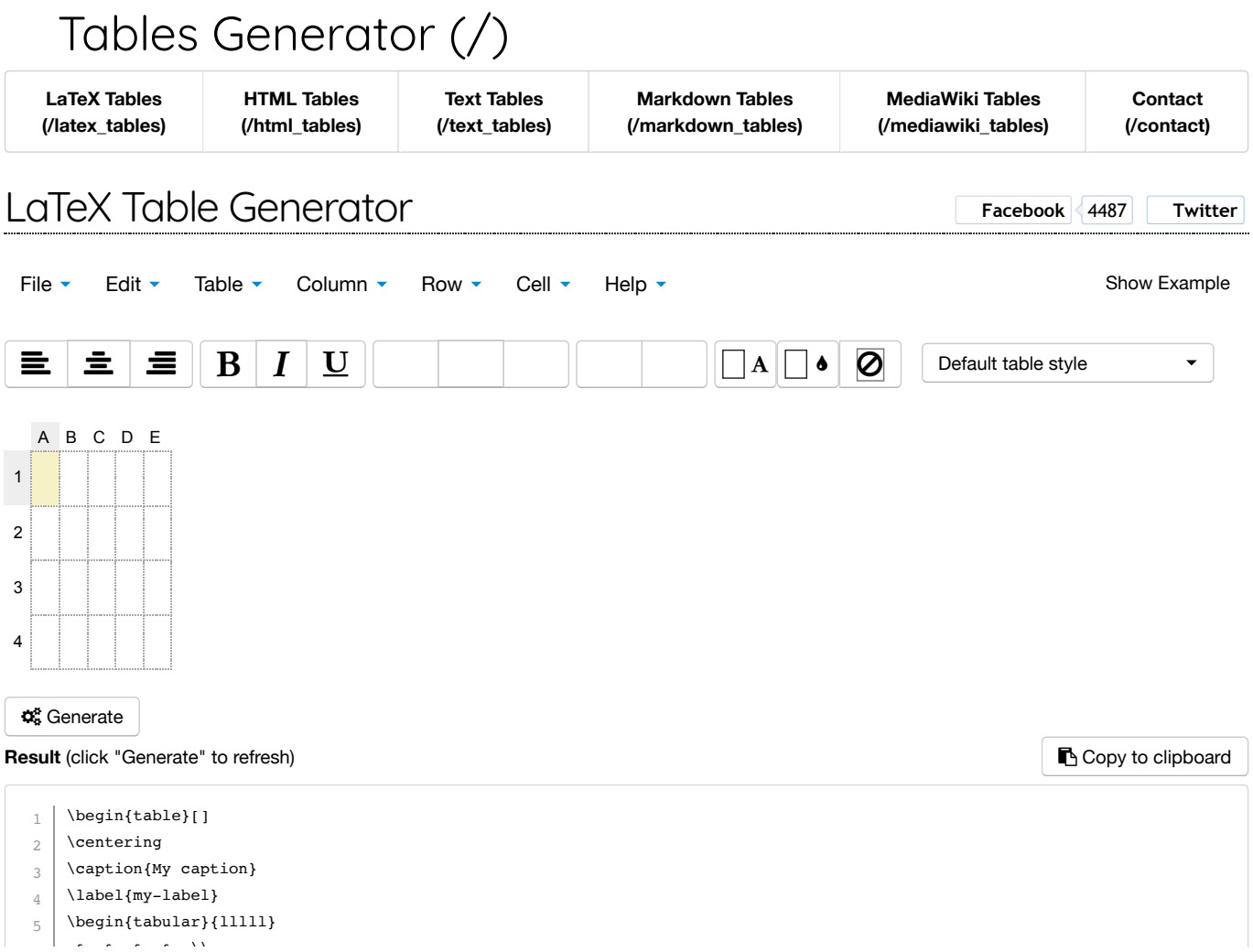
```
> library(sjmisc)
> library(sjPlot)
> xCSS = list(css.table = "border: 2px solid;",
+                 css.tdata = "border: 1px solid;",
+                 css.firsttablecol = "color:#003399;
+                 font-weight:bold;")
> data(efc)
> sjt.df(efc, altr.row.col = TRUE,CSS=xCSS)
```

HTML table with `sjPlot` package

Variable	*vars*	*n*	*missings*	*missings (percentage)*	*mean*	*sd*	*median*	*trimmed*	*mad*	*min*	*max*	*range*	*skew*	*kurtosis*	*se*
c12hour	1	902	6	0.66	42.4	50.81	20	31.43	17.79	4	168	164	1.65	1.31	1.69
e15relat	2	901	7	0.77	2.85	2.08	2	2.44	0	1	8	7	1.55	1.21	0.07
e16sex	3	901	7	0.77	1.67	0.47	2	1.71	0	1	2	1	-0.73	-1.47	0.02
e17age	4	891	17	1.87	79.12	8.09	79	79.05	8.9	65	103	38	0.06	-0.83	0.27
e42dep	5	901	7	0.77	2.94	0.94	3	3.02	1.48	1	4	3	-0.42	-0.84	0.03

Online LaTex and HTML tables

https://www.tablesgenerator.com



LaTeX tables with `xtable` package

```
> library(xtable)
> tli$grade<-tli$grade+rnorm(nrow(tli))
> tli.table <- xtable(tli[1:3,],align=c("l","c","l","l","c","c"),
+                     digits=c(0,2,0,0,0,0),
+                     caption="My table",label="tab1")
> tli.table
% latex table generated in R 3.4.2 by xtable 1.8-2 package
% Wed Nov 22 15:16:29 2017
\begin{table}[ht]
\centering
\begin{tabular}{lcllcc}
  \hline
 & grade & sex & disadvg & ethnicty & tlimth \\
  \hline
1 & 5.95 & M & YES & HISPANIC & 43 \\
  2 & 6.22 & M & NO & BLACK & 88 \\
  3 & 3.33 & F & YES & HISPANIC & 34 \\
   \hline
\end{tabular}
\caption{My table}
\label{tab1}
\end{table}
```

HTML tables with `xtable` package

```
>  library(xtable)
>  data(tli)
>  tli$grade<-tli$grade+rnorm(nrow(tli))
>  tli.table <- xtable(tli[1:3,],align=c("l","c","l","l","c","c"),
+                      digits=c(0,2,0,0,0,0),
+                      caption="My table",label="tab1")
> print(tli.table,type="html")
```

HTML tables with `xtable` package

	grade	sex	disadvg	ethnicty	tlimth
1	6.60	M	YES	HISPANIC	43
2	3.65	M	NO	BLACK	88
3	5.14	F	YES	HISPANIC	34

My table

Model LaTeX and HTML tables with `stargazer` package

1. Data Summary

```
> library(stargazer)
> data("attitude")
> head(attitude,3)
> stargazer(attitude,flip=T)

% Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Wed, Nov 22, 2017 - 14:33:03
\begin{table}[!htbp] \centering
  \caption{}
  \label{}
\begin{tabular}{@{\extracolsep{5pt}}lccccccc}
\\[-1.8ex]\hline
\hline \\[-1.8ex]
Statistic & rating & complaints & privileges & learning & raises & critical & advance \\
\hline \\[-1.8ex]
N & 30 & 30 & 30 & 30 & 30 & 30 & 30 \\
Mean & 64.633 & 66.600 & 53.133 & 56.367 & 64.633 & 74.767 & 42.933 \\
St. Dev. & 12.173 & 13.315 & 12.235 & 11.737 & 10.397 & 9.895 & 10.289 \\
Min & 40 & 37 & 30 & 34 & 43 & 49 & 25 \\
Max & 85 & 90 & 83 & 75 & 88 & 92 & 72 \\
\hline \\[-1.8ex]
\end{tabular}
\end{table}
>
```

Model LaTeX and HTML tables with `stargazer` package

2. Display a whole table

```
> stargazer(attitude, summary=FALSE)

% Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Wed, Nov 22, 2017 - 14:35:15
\begin{table}[!htbp] \centering
  \caption{}
  \label{}
\begin{tabular}{@{\extracolsep{5pt}} cccccccc}
\\[-1.8ex]\hline
\hline \\[-1.8ex]
 & rating & complaints & privileges & learning & raises & critical & advance \\
\hline \\[-1.8ex]
1 & $43$ & $51$ & $30$ & $39$ & $61$ & $92$ & $45$ \\
2 & $63$ & $64$ & $51$ & $54$ & $63$ & $73$ & $47$ \\
3 & $71$ & $70$ & $68$ & $69$ & $76$ & $86$ & $48$ \\
4 & $61$ & $63$ & $45$ & $47$ & $54$ & $84$ & $35$ \\
5 & $81$ & $78$ & $56$ & $66$ & $71$ & $83$ & $47$ \\
6 & $43$ & $55$ & $49$ & $44$ & $54$ & $49$ & $34$ \\
.... #Truncated output
```

Model LaTeX and HTML tables with `stargazer` package

3. Comparing models:

```
> library(stargazer)
> attitude$high.rating <- (attitude$rating > 70)
> linear.1 <- lm(rating ~ complaints + privileges + learning
+                          + raises + critical, data=attitude)
>
> linear.2 <- lm(rating ~ complaints + privileges + learning, data=attitude)
> probit.model <- glm(high.rating ~ learning + critical + advance, data=attitude,
+                     family = binomial(link = "probit"))
>
> stargazer(linear.1, linear.2, probit.model, title="Regression Results")
```

Model LaTeX and HTML tables with `stargazer` package

3. Comparing models:

LaTex file

```
% Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Wed, Nov 22, 2017 - 14:46:00
\begin{table}[!htbp] \centering
  \caption{Regression Results}
  \label{}
\begin{tabular}{@{\extracolsep{5pt}}lccc}
\\[-1.8ex]\hline
\hline \\[-1.8ex]
 & \multicolumn{3}{c}{\textit{Dependent variable:}} \\
\cline{2-4}
\\[-1.8ex] & \multicolumn{2}{c}{rating} & high.rating \\
\\[-1.8ex] & \multicolumn{2}{c}{\textit{OLS}} & \textit{probit} \\
\\[-1.8ex] & (1) & (2) & (3)\\
\hline \\[-1.8ex]
 complaints & 0.692$^{***}$ & 0.682$^{***}$ &  \\
  & (0.149) & (0.129) &  \\
  & & & \\
 privileges & $-$0.104 & $-$0.103 &  \\
  & (0.135) & (0.129) &  \\
  & & & \\
 learning & 0.249 & 0.238$^{*}$ & 0.164$^{***}$ \\
  & (0.160) & (0.139) & (0.053) \\
  & & & \\
 raises & $-$0.033 &  &  \\
  & (0.202) &  &  \\
  & & & \\
 critical & 0.015 &  & $-$0.001 \\
  & (0.147) &  & (0.044) \\
  & & & \\
 advance &  &  & $-$0.062 \\
  &  &  & (0.042) \\
  & & & \\
 Constant & 11.011 & 11.258 & $-$7.476$^{**}$ \\
  & (11.704) & (7.318) & (3.570) \\
  & & & \\
\hline \\[-1.8ex]
Observations & 30 & 30 & 30 \\
R$^{2}$ & 0.715 & 0.715 &  \\
Adjusted R$^{2}$ & 0.656 & 0.682 &  \\
```

```
Log Likelihood &  &  & $-$9.087 \\
Akaike Inf. Crit. &  &  & 26.175 \\
Residual Std. Error & 7.139 (df = 24) & 6.863 (df = 26) &  \\
F Statistic & 12.063$^{***}$ (df = 5; 24) & 21.743$^{***}$ (df = 3; 26) &  \\
\hline
\hline \\[-1.8ex]
\textit{Note:}  & \multicolumn{3}{r}{$^{*}$p$<$0.1; $^{**}$p$<$0.05; $^{***}$p$<$0.01} \\
\end{tabular}
\end{table}
```

Model LaTeX and HTML tables with `stargazer` package

3. Comparing models (HTML output)

```
> library(stargazer)
> attitude$high.rating <- (attitude$rating > 70)
> linear.1 <- lm(rating ~ complaints + privileges + learning
+                          + raises + critical, data=attitude)
>
> linear.2 <- lm(rating ~ complaints + privileges + learning, data=attitude)
> probit.model <- glm(high.rating ~ learning + critical + advance, data=attitude,
+                     family = binomial(link = "probit"))
>
> stargazer(linear.1, linear.2, probit.model,
+           type="html",
+           title="Regression Results",
+           single.row=TRUE,
+           ci=TRUE, ci.level=0.9,
+           omit.stat=c("f", "ser"))
```

Model LaTeX and HTML tables with `stargazer` package

3. Comparing models (HTML output)

Regression Results

	Dependent variable:		
	rating		high.rating
	OLS		*probit*
	(1)	(2)	(3)
complaints	0.692*** (0.447, 0.937)	0.682*** (0.470, 0.894)	
privileges	-0.104 (-0.325, 0.118)	-0.103 (-0.316, 0.109)	
learning	0.249 (-0.013, 0.512)	0.238* (0.009, 0.467)	0.164*** (0.077, 0.252)
raises	-0.033 (-0.366, 0.299)		
critical	0.015 (-0.227, 0.258)		-0.001 (-0.073, 0.072)
advance			-0.062 (-0.131, 0.007)
Constant	11.011 (-8.240, 30.262)	11.258 (-0.779, 23.296)	-7.476** (-13.349, -1.604)
Observations	30	30	30
R^2	0.715	0.715	
Adjusted R^2	0.656	0.682	
Log Likelihood			-9.087
Akaike Inf. Crit.			26.175

Note: *p<0.1;* ***p<0.05;*** p<0.01