R to LaTeX

SOME BASIC EXAMPLES TO GET YOU STARTED

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```
##############################################
## modified from ?tikzDevice::tikz
## Example 3 ##################################

##Make Fig
N=50
tf <- file.path(getwd(),'randomcircles.tex')
cols=rainbow(N,alpha=.5)
x=runif(N)
y=runif(N)
tikz(tf,standAlone=TRUE)
  plot(0:1,0:1,type="n",axes=F,xlab='',ylab='')
  points(x, y, pch=21,bg=cols, cex=10,lwd=2)
dev.off()

##Compile/View the output
tools::texi2dvi(tf,pdf=TRUE,clean=T)
system(
  paste(
    getOption('pdfviewer'),
    file.path(getwd(),'randomcircles.pdf')
  )
)

##############################################
```

```
% in preamble
\usepackage{tikz}

% in body
\tikz[overlay,remember picture]
   \node[at=(current page.center)]{
      {\transparent{0.75}
         \includegraphics[scale=0.5]{
            R/randomcircles.pdf
         }
      }
   }
;
```

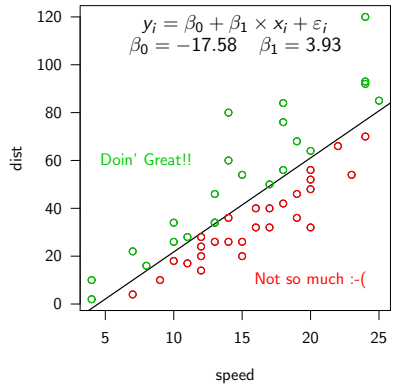
This presentation is available with accompanying R and LaTeX code at
\\cdc\project\CDC_ATSDR_RUG\Short_Presentations

Motivation

- Reproducible research
- Eliminate copy/paste errors
- Push-button data analysis documents
- Easy, preτty mathϵmatics in figures and tables
- Fonts of figures and tables match the rest of the document
- You can `x <- get(jiggy)` with the `\documentclass{beamer}`

Outline

Figures with `tikzDevice`



Tables with `xtable`

	mpg	cyl
Merc 230	22.80	4.00
Merc 280	19.20	6.00

R Code & Console Output

R

```r
# My ~rad~ model
(lm = lm(dist ~ speed, cars))
##
## Call:
## lm(formula=dist~speed,data=cars)
##
## Coefficients:
## (Intercept)        speed
##     -17.579        3.932
##
dx = d$char + fnx[fnx$stu!=d$sit,1:2]
```

Figures with `tikzDevice` | Example 1

R

```r
library(tikzDevice)
tikz("myFig.tex")
   # ...code to make
   #       a plot...
dev.off()
```

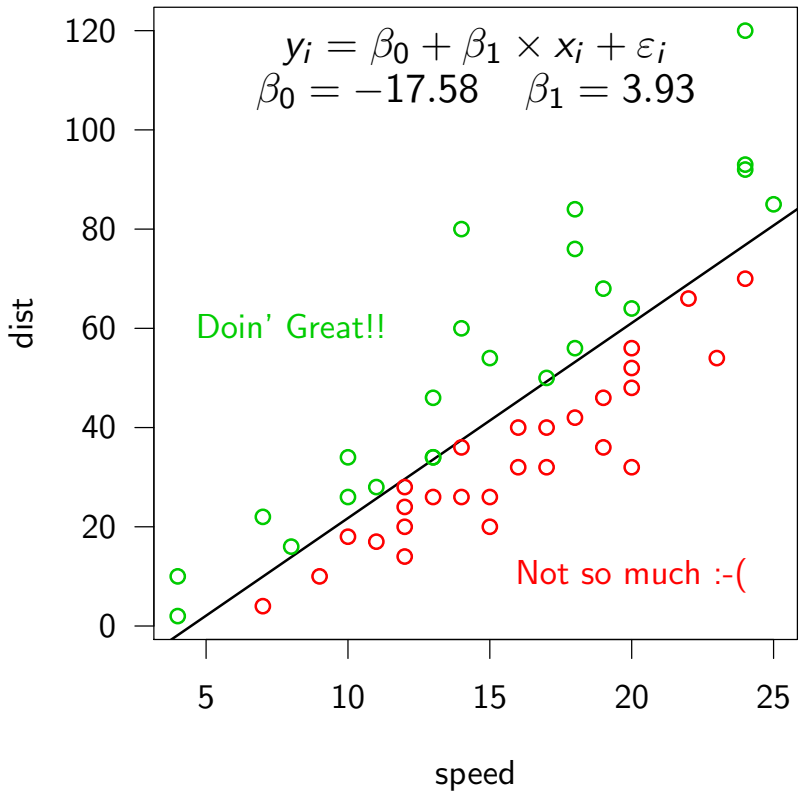
LaTeX

```latex
% in preamble
\usepackage{tikz}

% in body
\input{myFig.tex}
```

$$y_i = \beta_0 + \beta_1 \times x_i + \varepsilon_i$$

$$\beta_0 = -17.58 \quad \beta_1 = 3.93$$



Figures with tikzDevice | Example 2 – standAlone

R

```r
library(tikzDevice)
tikz("Fig.tex",
       standAlone=TRUE)
   # ...code to make
   #       a plot...
dev.off()
```

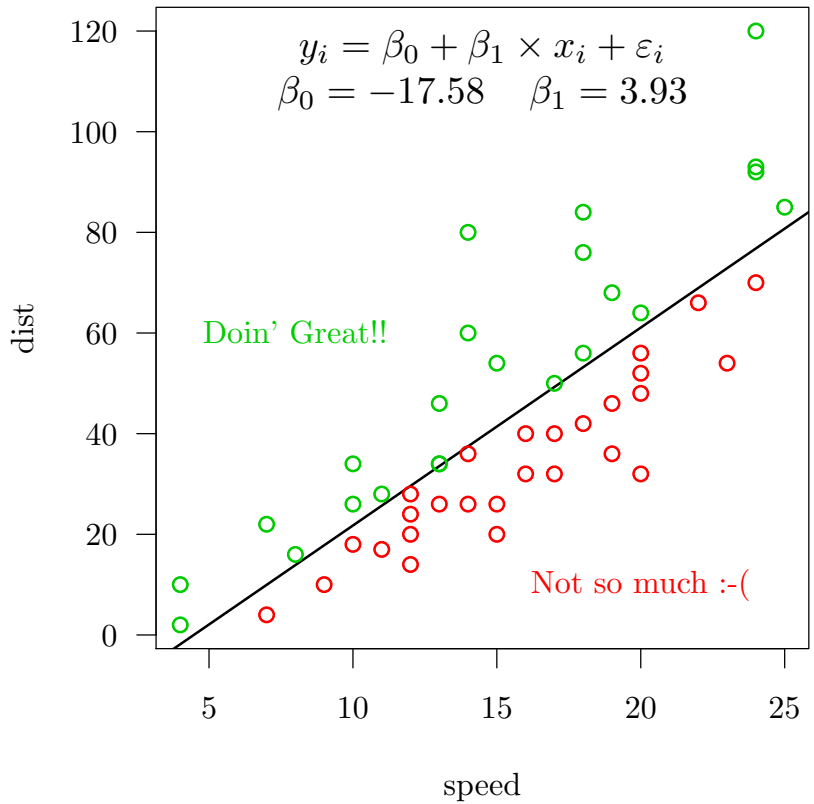
...then compile Fig.tex into a pdf file then ...

LaTeX

```latex
% in preamble
\usepackage{tikz}
% in body
\includegraphics{Fig.pdf}
```

$$y_i = \beta_0 + \beta_1 \times x_i + \varepsilon_i$$

$$\beta_0 = -17.58 \quad \beta_1 = 3.93$$



pro portable

con fonts may not match

Tables with xtable | Basic structure

R

```r
library(xtable)
Tab = # ....................  Make a table
TabX = xtable(Tab)           # Convert to LaTex code
print(TabX,file="Tab.tex")   # Save as text file
```

LaTeX

```latex
\input{Tab.tex}
```

Tables with `xtable` | Conversion to LaTeX code

R

```
Tab = mtcars[9:10, 1:2]
xtable(Tab)
## % latex table generated in
    R 3.0.1 by xtable 1.7-3
    package
## % Fri Nov 07 16:50:31 2014
## \begin{table}[ht]
## \centering
## \begin{tabular}{rrr}
##   \hline
##  & mpg & cyl \\
##   \hline
## Merc 230 & 22.80 & 4.00 \\
##   Merc 280 & 19.20 & 6.00 \\
##    \hline
## \end{tabular}
## \end{table}
```

The R function `xtable()` converts the data frame `Tab` into LaTeX code that can be read into a document using the `\input{}` LaTeX command

	mpg	cyl
Merc 230	22.80	4.00
Merc 280	19.20	6.00

Tables with xtable | A minimal working example

R

```r
library(xtable)
lm = lm(dist~speed,cars)
print(
    xtable(anova(lm)),
    file="output/lmanova.tex"
)
```

LaTeX

```latex
\input{R/output/lmanova.tex}
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
speed	1	21185.46	21185.46	89.57	0.0000
Residuals	48	11353.52	236.53		

Tables with xtable | Example with markup & formatting 1/3

R

```r
library(xtable)
lm = lm(dist~speed,cars)
sum = xtable(
    summary(lm),
    align="rcccc"          # Column alignments
)
```

Tables with `xtable` | Example with markup & formatting 2/3

R

```r
# Math markup in row and column headings
rownames(sum) = c(
    "Intercept, $\\beta_0$",
    "speed, $\\beta_1$"
)
colnames(sum) = c(
    "$\\hat{\\beta_j}$",
    "$\\hat{\\sigma}(\\hat{\\beta_j})$",
    "$t_{\\hat{\\beta_j}}$",
    "$P(t_{\\hat{\\beta_j}}>|t_{\\nu=48}|)$"
)

# Set rounding of numbers
digits(sum) = c(0,2,2,2,4)
```

Tables with xtable | Example with markup & formatting 3/3

R

```r
print(
    sum,
    file="output/lmsum.tex",
    # An identity "sanitize" function
    # (i.e. no sanitization)
    sanitize.text.function=function(x){x}
)
```

LaTeX

```latex
\input{R/output/lmsum.tex}
```

	$\hat{\beta}_j$	$\hat{\sigma}(\hat{\beta}_j)$	$t_{\hat{\beta}_j}$	$P(t_{\hat{\beta}_j} > \lvert t_{\nu=48} \rvert)$
Intercept, β_0	-17.58	6.76	-2.60	0.0123
speed, β_1	3.93	0.42	9.46	0.0000

Tables with `xtable` | A real life example

Table 2: Results for the univariate Cox proportional hazards models.

Variable	Beta (SE)	HR	95% CI for HR	P
Female vs. Male	0.132 (0.131)	1.141	(0.884, 1.474)	0.31
Age Class				
<18 (ref)	-	-	-	-
18-24	-0.439 (0.221)	0.645	(0.418, 0.994)	0.05
25-34	-0.751 (0.280)	0.472	(0.272, 0.818)	0.007
35-55	-0.294 (0.224)	0.745	(0.480, 1.157)	0.19
Education				
blank (ref)	-	-	-	-
Primary	-0.088 (0.522)	0.916	(0.329, 2.549)	0.87
Secondary	-0.307 (0.168)	0.735	(0.529, 1.022)	0.07
Beyond	-0.143 (0.232)	0.867	(0.550, 1.367)	0.54

Courtesy of Chuck Rose, PhD (NCHHSTP/DHAP)

- With the `txtStart()` and `txtStop()` functions in the `TeachingDemos` R package we can send submitted code and console output to a text file
- We can then use a custom R function to format this text file
- With that plus the `listings` LaTeX package we can do:
  - Code blocks with/without console output
    avoids cut/paste errors
  - Inline code ; see examples above
- Like sweave/knitr but more control, "manual"
- See code in following directory for my first go at it
  (used in previous RUG talk – a bit different than these slides)
  `\\cdc\project\CDC_ATSDR_RUG\Short_Presentations\4_Stewart_R_Intro_26June2014\BSeasieR2LaTeX`

R Code & Console Output | Example Usages

R

```r
# Has console output functions
library(TeachingDemos)

# Custom format console output for latex presentations
myR2latex=function(FN){
   txtStop() # in TeachingDemos package
   tmpTxt=readLines(FN)
   for(i in seq.int(tmpTxt)){
      if(
         !1%in%gregexpr(">",tmpTxt[i])[[1]] &
         !1%in%gregexpr("\\+",tmpTxt[i])[[1]]
      ){
         tmpTxt[i] = paste("@@##",tmpTxt[i])
      }
      else{
         tmpTxt[i] = sub("> ","",tmpTxt[i])
         if(1%in%gregexpr("\\+",tmpTxt[i])[[1]]){
            tmpTxt[i] = sub("\\+ ","",tmpTxt[i])
         }
      }
   }
   tmpTxt=c("\\begin{myRchunk}",tmpTxt,"\\end{myRchunk}")
   write(tmpTxt,FN)
}

# Example Usage
FN="formatted_R_code.txt";txtStart(FN)
        # ... R code that you want
        #       as a block of formatted R
        #       code and console output in latex ...
myR2latex(FN)
```

LaTeX

```latex
% In preamble
\input{myRListingsPreamble}

% Input block of code and
    console output
\input{formatted_R_code.txt}
%where formatted_R_code.txt is a
    txt file created with
    myR2latex

% As an environment:
\begin{myRchunk}
        ... R code ...
\end{myRchunk}

% Inline code:
\myRinline{... R code ...}
```

Title Slide code

R

```r
################################################
## modified from ?tikzDevice::tikz
## Example 3 ###################################

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      getOption('pdfviewer'),
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   )
)

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```latex
% in preamble
\usepackage{tikz}

% in body
\tikz[overlay,remember picture]
   \node[at=(current
    page.center)]{
      {\transparent{0.75}

    \includegraphics[scale=0.5]{
            R/randomcircles.pdf
         }
      }
   }
;
```