R Quick Tour

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Basics of R

Key Points

- It's where new methods are developed first
- Over 8000 add on packages and tools
- It is open source and free to use (except occasional packages)
- Don't think of R as a "statistics program."
- R is primarily a *programming language*

Reasons to Use R

- For the latest statistics methods
- For maximum power to develop your own analyses
- It excels for iteration and automation
- Large community support for advanced analytics
- It's free
- Includes integrating reporting capabilities (such as these slides)

Reasons not to Use R

- It requires programming to do most analyses
- Routine analyses are more difficult at first
- Charting and plotting are not easy, and tend to be rather basic unless they are tweaked substantially

GUI Tour

- R base
- R Studio

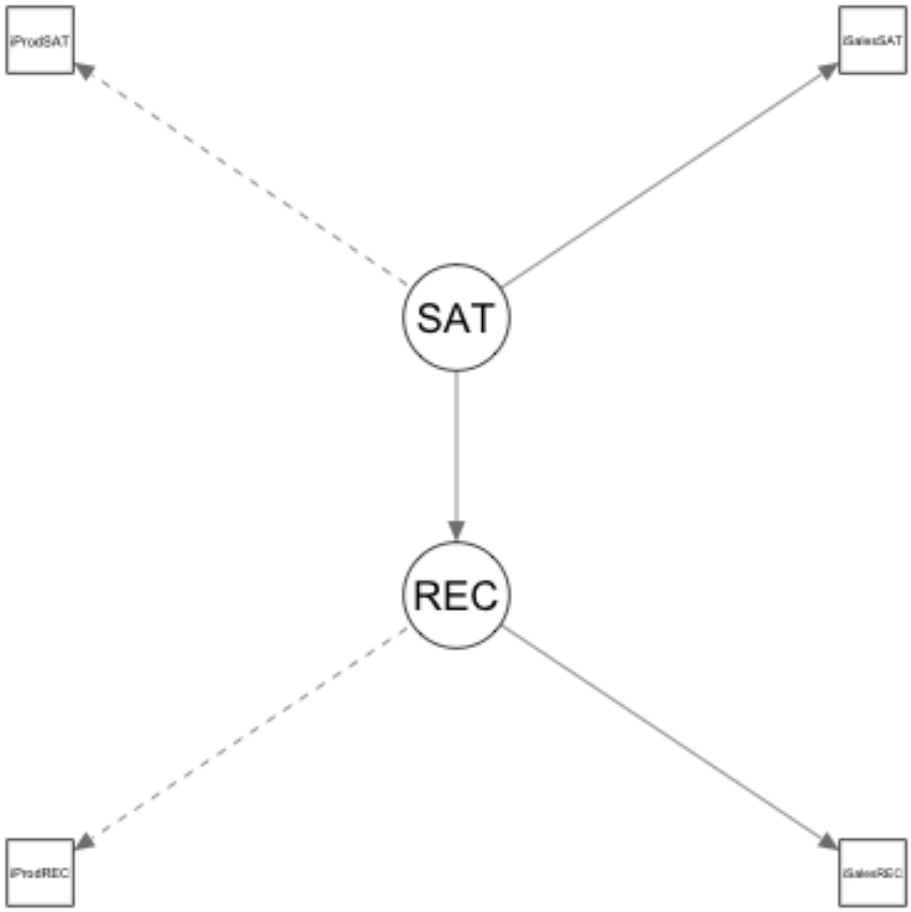
Switch to RStudio and look at the elements of the R IDE (integrated development environment)

Customer Satisfaction Data (simulated)

We'll use a data set from Chapman & Feit (2015).

- CSat survey with 4 items
- 2 Satisfaction items: with Product & Sales
- 2 Likelihood to recommend items: Product & Sales
- Each item assessed on 7 point Likert scale

Customer Satisfaction Model



Code

Let's switch to R and walk through some typical code ...

```
satData <- read.csv("http://r-marketing.r-forge.r-project.org/data/rintro-chapter2.csv")

# examine the data
head(satData)
str(satData)
summary(satData)
```

```r
# convert Segment to a factor variable
satData$Segment <- factor(satData$Segment)
summary(satData)

# Satisfaction by segment
library(ggplot2)
by(satData$iProdSAT, satData$Segment, mean_se, mult=1.96)


###### EXAMPLE OF PLOTTING

### first aggregate the data we want to plot
# ... there are other ways to do this, but this illustrates data frame manipulation

# get the mean and standard errors
prod.sat.seg <- aggregate(satData$iProdSAT, list(satData$Segment), mean_se, mult=1.96)
str(prod.sat.seg)

# coerce those to a nice data frame
prod.sat.seg <- data.frame(prod.sat.seg$Group.1, lapply(data.frame(prod.sat.seg$x), unlist))
prod.sat.seg

# and label the columns to be more readable
names(prod.sat.seg) <- c("Segment", "average", "lowerCI", "upperCI")
prod.sat.seg

### the plot itself ...

# now plot the interquartile range
p <- ggplot(data=prod.sat.seg,
            aes(x=Segment, y=average, ymax=upperCI, ymin=lowerCI)) +
     geom_point() +
     geom_errorbar()

p

# color the points and make them larger
p <- ggplot(data=prod.sat.seg,
            aes(x=Segment, y=average, ymax=upperCI, ymin=lowerCI)) +
     geom_point(aes(color=Segment), size=3) +      # <=======
     geom_errorbar()

p

# color the error bars and make them narrower
p <- ggplot(data=prod.sat.seg,
            aes(x=Segment, y=average, ymax=upperCI, ymin=lowerCI)) +
     geom_point(aes(color=Segment), size=3) +
     geom_errorbar(aes(color=Segment), width=0.3)      # <=======

p

# adjust the Y axis range
```

```
p <- ggplot(data=prod.sat.seg,
            aes(x=Segment, y=average, ymax=upperCI, ymin=lowerCI)) +
     geom_point(aes(color=Segment), size=3) +
     geom_errorbar(aes(color=Segment), width=0.3) +
     coord_cartesian(ylim=c(1, 5))    # <========

p

# add some titles to be more readable
p <- ggplot(data=prod.sat.seg,
            aes(x=Segment, y=average, ymax=upperCI, ymin=lowerCI)) +
     geom_point(aes(color=Segment), size=3) +
     geom_errorbar(aes(color=Segment), width=0.3) +
     coord_cartesian(ylim=c(1, 5)) +
     ggtitle("Average Sat and Confidence Interval by Segment") +    # <=====
     ylab("Mean satisfaction and 95% CI")

p


########## CORRELATIONS

# correlation matrix
library(corrplot)
corrplot(cor(satData[ , -3]))

# tinker with the plot
corrplot.mixed(cor(satData[ , -3]))


#### ADVANCED MODELING. EXAMPLE: SAT/REC STRUCTURAL MODEL

# define a structural model for Satisfaction and Recommendation
satModel <- "SAT =~ iProdSAT + iSalesSAT
             REC =~ iProdREC + iSalesREC
             REC ~  SAT "

# fit the structural model
library(lavaan)
sat.fit <- cfa(satModel, data=satData)

# look at the fit
summary(sat.fit, fit.measures=TRUE)

# plot the structural model
library(semPlot)
semPaths(sat.fit, what="est", nCharNodes=9, residuals=FALSE)
```

Pros and Cons

Pro

1. Extreme power and precision. It does exactly what you want.

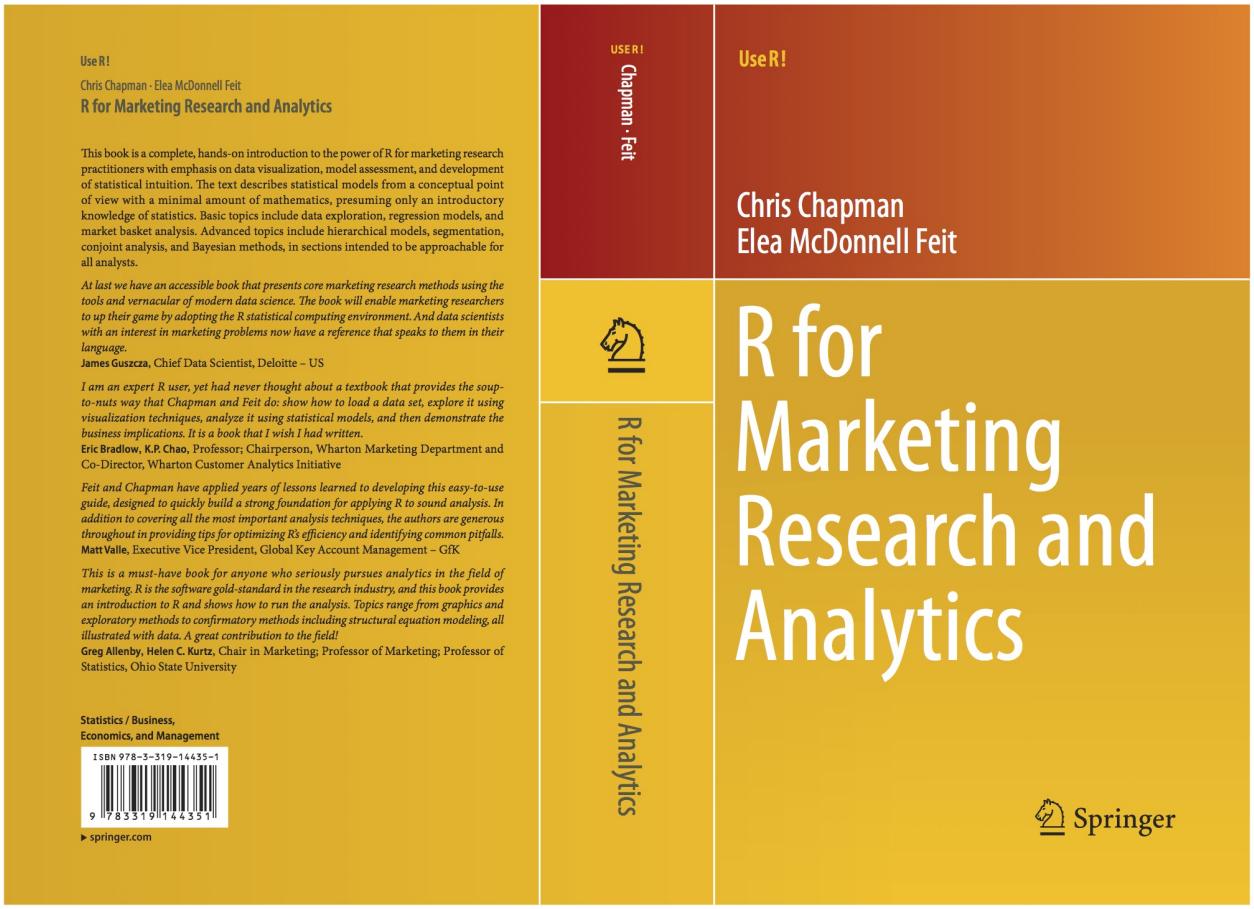
2. Complete flexibility at every step
3. Once script is done it is reusable and re-runnable

Con

1. It only does exactly what you tell it. Defaults are missing or ugly.
2. You have to write code.
3. Everything takes longer . . . the *first* time.

Next Steps

1. Get R from r-project.org & RStudio from rstudio.com.
2. See starting points at CRAN Task Views
3. Find a class or hands-on tutorial (maybe this book? The code here is based on Chapter 2.)



The Most Important Things

To learn R, you will need: - Skill or genuine interest in learning to **program** - A **real data problem** that you need to solve - Routine **methods that you understand** well (e.g., ANOVA, lm) - **Time** to work through the steep learning curve - **Discipline** to force yourself to finish the project! - Ability to **iterate** on successive projects, as it gets easier and easier

Only try advanced/new methods after you are fluent in the basics.

Q&A

Thank you!

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